ABSTRACT

Title of Dissertation: THE INITIAL ACADEMIC MAJOR DECISION-MAKING PROCESS: AN APPLICATION OF AZJEN'S THEORY OF PLANNED BEHAVIOR

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Students' initial academic major choice can expose them to socializing factors and resources that can facilitate or impede success in their first year of college. When discussing progress, retention, persistence, attainment, and completion, policy makers, administrators, and scholars very rarely discuss how students settle on a chosen major in the first place. An understanding of the levers that influence initial academic major choice allows for interventions that may lead to choices which fit students' academic interests, expectations, goals, and abilities.

This study employs binary logistic regression (LR) to examine initial academic major choice as a dichotomous outcome - declared or undecided. The conceptual model for this study is an interpretation of Azjen's (1991) Theory of Planned Behavior (TPB) where the decision-making process under study includes students' predisposition towards, deference to others about, volition over, and

intentions related to the fundamental decision whether to start college with a declared major or none at all. The incorporation of behavioral, normative, and control beliefs into these constructs allows for an examination of determinants of behavior that underlie students' perceptions related to their initial academic major choice.

In examining factors that induce one student to make one decision and another student to make another decision, the findings of this study indicate the specific levers found to be significant in the initial academic major decision-making process are: 1) positive attitudes about starting college with a declared major; 2) family members who believe in starting college with a declared major and the importance of those family members to the student; and 3) how difficult it was for the student to make the decision. Additional sub-sample analyses and tests for equality of B coefficients reveal that the sources and influence of some factors are different for different groups of students based on sex and race/ethnicity. Implications for practice and research include institutions of higher education honing the content and audiences of messaging related to initial academic major choice; strengthened partnerships between K-12 and institutions of higher education; and the use of more sophisticated statistical techniques, as well as sub-group data analyses.

THE INITIAL ACADEMIC MAJOR DECISION-MAKING PROCESS:

AN APPLICATION OF AZJEN'S THEORY OF PLANNED BEHAVIOR

by

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Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2015

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DEDICATION

To the students who provided me opportunities to follow my passion and make a difference.

ACKNOWLEDGEMENTS

"Marriage involves a willingness to see things through to the end." Thank you, Roger, for letting my dream become our dream. Thank you for walking beside me through this endeavor and having faith in our journey together.

Thank you, Dr. Julie Park, my advisor and chair, for taking me on as an advisee when I needed the new start. I am thankful for the patience and understanding you have shown me while helping me get across the finish line.

Thank you, Drs. Robert Croninger, Gregory Hancock, Sharon Kirkland-Gordon, and Robert Lent, for making time for me and my dissertation. The many times I needed a little clarity in order to move forward or to change course, you all were willing to provide just the right amount of guidance.

Thank you, Colette Taylor and Mark Sadowski, for opening up your homes. The proposal and final chapters would have taken much longer to write without your willingness to house me for and feed me during my binge-writing retreats.

Thank you, Joann Prosser, my supervisor and my friend, for being my unsung champion. You could have just taught me SPSS and sent me on my merry way, but instead you were willing to be my safety net when the bottom dropped out. You, Carole, and many many others in the DRL gave me a home at the University of Maryland.

Thank you, Jay Garvey, Aileen Hentz, Michele Matteo Mackie, Beth Niehaus, and Léna Kavaliauskas Crain, for your openness to be a part of my journey when you were/are on journeys of your own.

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CHAPTER 1 - INTRODUCTION

Statement of the Problem

As American colleges and universities double their efforts to increase degree completion and attainment rates, little attention is given to how students settle upon their choice of academic major in the first place (National Commission on Higher Education Attainment, 2013). A student's choice of academic major is one of the most significant college-related decisions he or she will make (Selingo, 2013). The major a student chooses is more than just a future field of study; it has the potential to determine one's access to higher education since some students take into account the strength and availability of their academic major at a given institution when deciding where to attend (Supiano, 2011). As will be described later in the chapter, one's chosen major can also dictate the experiences and opportunities a student will have in college, with significant lifelong implications. Before students are faced with the decision of which major to declare they are faced with an even more fundamental question: "Do you even want to declare a major?" The response to this fundamental question and the influences on the decision-making process have not been widely studied. This study examines the influences of pre-college factors in the initial academic major decision-making process, within the context of the fundamental decision whether to start college with a declared major or with none at all.

This chapter provides the context of why a study of influences in the initial academic major decision-making process is warranted. The first half of this chapter includes an overview of the undergraduate curriculum; college and post-graduation outcomes related to academic major; and the potential consequences of an

uninformed choice of academic major. The latter half of the chapter presents the purpose, research questions, and significance of the study. The chapter concludes with an outline of the remaining chapters of the dissertation.

The American Undergraduate Curriculum

Debates about the purpose and goals of higher education have existed for as long as there have been institutions of higher learning. The aims of higher education in colonial times grew out of a need for literate clergy and competent men to fill political offices (Brubacher & Rudy, 1997). Over the decades the purpose of higher education evolved to include notions such as the search for new knowledge and building skills for continued learning (Brubacher & Rudy, 1997; Schneider & Green, 1993). As the quality of an American college education continues to be scrutinized in recent decades, the focus on cognitive learning, emotional and moral development, and practical competence as the outcomes for higher education has increased (The Carnegie Foundation, 1977; Renn & Reason, 2013). One consistent purpose among the differing ideas, however, is that the curriculum of higher education should result in more learned members of society. As Boyer (1987) states, "This nation and the world need well-informed, inquisitive, open-minded young people who are both productive and reflective, seeking answers to life's most important questions. Above all, we need educated men and women who not only pursue their own personal interests but are also prepared to fulfill their social and civic obligations" (p. 7).

To this end, many models of a liberal education have existed upon which to base college curriculum. The contemporary model combines the nineteenth-century model of specific knowledge acquisition with the research era where ways of

knowing are central (Schneider & Green, 1993). It was from the nineteenth-century model that the academic, or college, major as we know it today was born. The undergraduate curriculum is an exercise in breadth and depth – general education and the specialized major (Schneider & Green, 1993). On average, major coursework accounts for approximately two thirds of the credits in a degree program (Schneider & Green, 1993). The academic major ties students to faculty with similar interests and socializes students to the norms of a discipline (The Carnegie Foundation, 1977), norms which are invaluable for those continuing on for graduate work in the same or similar discipline. These cultures and structures reveal themselves in pedagogy and relationships (Kreber, 2009). Aside from a few exceptions (e.g., five-year degree or dual-degree programs), the American undergraduate curriculum is designed to be completed in four academic years (e.g., eight semesters, 120 credits, 15 credits per semester). However, the National Center for Education Statistics (NCES) (2012) calculated the four-year graduation rate of full-time students who started college in 2004 to be only 38%. The following section describes the effects of academic major on access to experiences and opportunities, growth as a person, and life beyond college.

Why Academic Major Matters

With approximately two-thirds of students' academic coursework determined by a specific academic major, it is understandable that the academic major affects the experiences students will have in college, as well as students' personal development.

Experiences in College

As the curricula of academic majors have evolved to stay relevant to changes in society, so too has the undergraduate experience. During one's undergraduate years the academic major can determine academic experiences such as access to and quality of academic advising; class size, composition, and availability; and levels and types of engagement with faculty. Co-curricular experiences such as opportunities to participate in student organizations, hold leadership positions, study abroad, or take on an internship or cooperative educational experience (co-op) can also depend on academic major. Internships and co-ops in particular have gained the attention of students and parents alike due to concerns about employability after college (Malcolm, 2013). As a socializing influence, one's academic major also shapes the climate of the educational environment experienced by a student (Arum & Roksa, 2011). For example, supportive climates may encourage students' sense of belonging while a competitive climate may promote a feeling of alienation as students fend for themselves (Seymour & Hewitt, 1997).

Growth as a Person

The experiences and opportunities made available to students as a result of their academic major choice have been found to affect students' development on a variety of fronts. Pedagogical approaches have been related to increases in students' verbal, quantitative, and subject matter knowledge by graduation (Pascarella & Terenzini, 2005). In addition to subject matter proficiency and the building of academic skills, academic major has also been found to account for differences in students' socio-political attitudes and values, racial-ethnic attitudes, moral

development, and cognitive and intellectual growth (Pascarella & Terenzini, 2005). Increased critical thinking, academic self-concept, and the development of a self-authoring mind are also found to differ among academic majors (Arum & Roksa, 2011). The development of these skills, knowledge, and experiences have been the focus of much of the attention on post-graduate outcomes (Arum & Roksa, 2011), especially as college graduates search for ways to distinguish themselves from peers in the difficult job market.

Life Beyond College

The implications of academic major choice extend beyond the undergraduate collegiate years, with a significant amount of attention in recent years on employability. A series of reports released by Georgetown University's Center on Education and the Workforce found that lifelong earnings and unemployment rates are related to academic major and educational attainment (Carnevale, Rose, & Cheah, 2011; Carnevale, Strohl, & Melton, 2011). In addition, while unemployment among bachelor's degree holders is lower than those with only a high school degree or high school drop-outs, unemployment impacts different majors differently. For example, in current economic times, architecture degree graduates are experiencing unemployment at a higher rate than science degree graduates (Carnevale & Cheah, 2013). Career access and mobility, job satisfaction, and personal health also vary among degree holders (Vila, Garcia-Aracil, & Mora, 2007). The following section describes the potential consequences when the initial academic major choice is not a good fit to students' academic skills and preparedness.

Consequences of an Uninformed Choice

All college graduates end up in the same place at the end of their undergraduate years – as graduates with at least one degree in a specific academic major. However, not all college graduates begin their educational journey in the same place. Some students matriculate and complete college in the same major. Some students matriculate in one major only to complete college in a different major. Other students start college as undecided students, knowing that a decision typically needs to be made prior to upper-division coursework. Since collegiate experiences from the day of acceptance depend on where a student will begin their educational journey, it is important the student chooses the path that fits their interests, expectations, goals, and academic ability.

Poor academic skills or lack of academic preparedness are cited as important factors as to why students take longer to graduate or drop out of college completely (Kuczynski-Brown, 2012; Ramaley, 2012). A report by ACT (2012) indicated that only one in four high school students in the United States is ready for college-level coursework in all four content areas of English, reading, math, and science. The college-level courses in which a student will enroll for any given semester are determined by the academic major or interests. Consequently, some students begin coursework in which they will later struggle because they are ill-prepared. This is especially problematic for STEM disciplines as the percentage of students ready for college-level coursework in math and science is lower than for English and reading (ACT, 2012).

The mismatch in preparedness for required coursework can result in students re-taking courses to earn better grades. Students who do this are eight times more likely to earn extra credits beyond what is required of their degree (Wang-Dahlback & Shiveley in Berrett, 2012), and thus potentially increase time to degree. The added time to obtain a degree comes with added considerations, including but not limited to the "real" cost of the additional time to the individual as well as society as a whole. Yoder (2011) estimated that the real price of an extra year of college, including lost income, can range from $45,000 to $90,000 or more. These real costs are one reason why students and parents are paying more attention than ever before to institutions' four-year graduation rates (Selingo, 2013). In addition, there are more than one trillion dollars outstanding in student loans in the United States, and payment postponement and default rates are on the rise (Martin & Lehren, 2012). For some students an additional year of college translates into delaying a major purchase, moving in with parents, and even temporarily stopping their education (Martin & Lehren, 2012). Schneider and Yin (2011) estimated the losses resulting from full-time bachelor degree seeking students who started college in 2002 but failed to graduate in 150% of normal time (i.e., 6 years) to be $3.8 billion lost in income, $566 million lost in federal income taxes, and $164 million lost in state income taxes nationwide.

American colleges and universities graduate just over half of the students who enroll (Leonhardt, 2011; Schneider & Yin, 2011). In a study examining students who dropped out of school during a seven-year period, it was found that 70% of those who left did so in part because of anticipated or received grades (Counseling Center

Retention Study Group, 2010). It does not benefit anyone to start but not complete a college degree. According to a 2011 American Institutes for Research report on low graduation rates, students who do not complete their first year of college cost states more than $1.3 billion and the Federal Government an additional $300 million each year (Schneider & Yin, 2011).

So how exactly does a student go about choosing an initial academic major that fits their interests, expectations, goals, and abilities? In contrast to how much time and thought many students put into their choice of a college, the choice of an academic major is sometimes an uninformed choice and has been described as random or last-minute (Beggs, Bantham, & Taylor, 2008; Selingo, 2012; Selingo, 2013). The American public is not, however, at a loss for information about academic majors. News outlets regularly report on the least useful majors, the most in-demand majors, and even how major choice is dictated by a professor or by the bottom line (Dewey, 2012; Gearon, 2012; Jaschik, 2013; Malcolm, 2013). As will be described in Chapter 2, colleges and online college guides provide information on the pros and cons of declaring a major and factors upon which to base the decision. Yet in the pursuit of an undergraduate degree students may dismiss altogether or not utilize resources (Firman & MacKillop, 2008). Students will read or hear conflicting or confounding messages not only about which major to pick, but more fundamentally, whether or not they should start college with a declared major or none at all.

Whether stemming from bad information or information overload, the beliefs and behaviors of students related to their initial academic major choice demonstrate

that many are not informed about the academic experience or the role academic major plays in broader collegiate experiences and opportunities. The 2012 annual survey of freshmen conducted by the Higher Education Research Institute (HERI) found that 13% percent of entering freshmen indicated chances are very good they will change their major and 8.1% were undecided on their major (Pryor, Eagan, Palucki Blake, Hurtado, Berdan, & Case, 2012). The same survey indicated that 84% of respondents believed they will graduate from college in 4 years, even though the current national graduation rate is less than half of that at 38% (NCES, 2012; Pryor et al., 2012).

The economic downturn and increased cost of higher education in the United States has had a profound impact on its citizenry's ability to afford, and the government's ability to provide and support, postsecondary education (Selingo, 2013). Coupled with public concern about quality and employability, college is increasingly being viewed in a return-on-investment perspective (Arum & Roksa, 2011) with the payout of the investment dependent on the choice of academic major. The academic major is a cornerstone of the undergraduate degree because of the effects the curriculum, structures, and cultures have on experiences in college, personal growth, and post-graduate outcomes. In order to assist students in their decision-making process to choose a major that is a good fit for interests, expectations, goals, and abilities, it would be helpful to know what and who weighs most on the minds of students during this process. A better understanding of these things can help institutions of higher education (IHEs) craft and emphasize certain messages about initial academic major choice, hone in on sources of influences on the decision, and address perceived barriers in the decision-making process. An

improved understanding is particularly important as policy makers and others seek to encourage enrollment as a whole in particular fields of study (e.g., STEM), as well as enrollment by certain groups of students based on sex and race/ethnicity.

Definition of Terms

Before proceeding further it is useful to define some terms used throughout this dissertation. Academic *major* refers to the area of specialization in the undergraduate curriculum, or "the subject or area of study in which a student concentrates" (University of North Carolina Charlotte [UNCC], 2013). Academic major *choice* refers to students' behavior of specifying a field of study. While most institutions ask applicants to indicate an intended major on the application for admission, policies may vary in regards to when the choice is formally declared. In general, undergraduate students have the option to declare a major upon matriculation or matriculate as an *undecided* or undeclared student. Majors that are referred to as undecided or undeclared are technically not majors as they are not degree-granting programs. *Sex* refers to an individual's biological status and is commonly defined along a binary of male or female (American Psychological Association [APA], 2011). *Gender* refers to "the attitudes, feelings, and behaviors that a given culture associates with a person's biological sex" (Introduction; APA, 2011). Since data being used for this study captured biological sex the term sex will be used in lieu of gender, even in instances where other researchers used gender.

Purpose of the Study

A student's chosen academic major places them in environments with particular socializing influences, determines resources available while in college, and has ramifications during and after college. The purpose of this exploratory study is to examine the influence of pre-college factors in the initial academic major decision-making process. To ground our understanding in the most basic facets of this process, this exploratory study scales the choice of academic major down to a fundamental decision that often precedes the selection of a specific major: whether to choose to start college with a declared major or none at all. An examination of the influences on this fundamental decision contributes to our broader understanding of what weighs most on students' minds and can inform the design and implementation of interventions to guide students towards the choice that is a good fit for their interests, expectations, goals, and abilities.

Research Questions

The research questions for this exploratory study are:

1. Which pre-college factors influence students' decisions to start college with a declared major or none at all?
2. Do the factors differ for different groups of students based on sex and race/ethnicity?

Overview of the Design of the Study

The design of the study is guided by Ajzen's (1991) Theory of Planned Behavior (TPB), a theory designed to explain and predict human behavior. Secondary cross-sectional survey data used for this study were collected in the

spring of 2013 by the on-campus housing department at a large public research I institution located in the mid-Atlantic. A random sample of students with freshman and sophomore class standing who live on campus were invited to participate in the study. Survey items included in the instrument were adapted and/or used with permission from the authors. Some survey items were drawn from the 2013 Student Experience in the Research University (SERU) Survey (The Regents of the University of California, 2013) and the NCES (2002) Education Longitudinal Study of 2002 (ELS:2002) base year questionnaire items. Context-specific items related to academic major decision making were adapted from one of the few studies to employ the TPB in the study of educational outcomes - Davis, Ajzen, Saunders, and Williams' (2002) examination of factors related to high school completion, or derived based on Azjen's own work (2002). University-owned demographic and background data points were merged with survey responses to allow for comparisons between distinct groups of students based on 1) sex and 2) race/ethnicity. This exploratory study employs block entry binary logistic regression as the statistical technique to answer the two research questions.

Significance of the Study

Many previous studies about major choice simply describe choices and behaviors in terms of frequencies based on a variety of demographic data points such as sex, race, religion, and parental characteristics (Kimball, Mitchell, Thornton, & Young-Demarco, 2009; Pearson & Dellman-Jenkins, 1997; Simpson, 2001). Most all studies of major choice study the choice of a specific field (e.g., social or hard

sciences) or specific major (e.g., psychology or chemistry). Some studies employ theoretical perspectives such as person-environment fit, human capital, motivation, and family capital (Blakemore & Low, 1984; Hwang & Vrongistinos, 2006; Porter & Umbach, 2006; Song & Glick, 2004), while other studies are not grounded in any specific theory (e.g., Cunningham & Smothers, 2010).

Not enough of these studies, however, examine the potential reasons underlying initial academic major decision making. That is, what induces students to make the decision they do? And while the primary interest of this exploratory study is the influences in the decision-making process, the scaling down of the decision to whether a student enters declared or undecided adds to a body of literature that does not typically consider the experience of the undecided student. This exploratory study seeks to fill a gap in the literature by examining the beliefs students hold about starting college with a declared major or none at all, the sources and power of the opinions others hold about this decision, the level of control students perceive they have to make the decision, and the effort students put forth to make an informed decision.

An examination of the influence of various factors on the initial academic major choice can provide a more informed explanation of how students go about making this fundamental decision. In the barrage of well-intentioned messages and advice related to academic majors this study has the potential to shed light on what and who weighs most in students' decisions related to academic major. An understanding of what is related to academic major decisions and behaviors may allow high schools and IHEs to better or more accurately hone the messages they

send to college-bound students about initial academic major choice, as well as establish practices and policies, so as to help students make informed decisions. Findings from this study may also be adapted into strategies and resources that can potentially help students better understand themselves and their options and thus make a decision well suited for their interests, expectations, goals, and academic abilities. In the long run, if students are able to make more informed decisions related to their major, administrators at IHEs can better manage human (e.g., faculty teaching loads), financial (e.g., allocations based on FTE), and physical resources (e.g., laboratory spaces) because they can better manage demand and enrollment in academic programs.

Conclusion

When discussing progress, retention, persistence, attainment, and completion, policy makers, administrators, and scholars very rarely discuss how students settle on a chosen major in the first place. This chapter discussed the significant effects of a chosen major on students' curricular experiences, experiences outside of the classroom, personal development, and long-term outcomes. Adverse effects as a result of an uninformed major choice were also highlighted. Poor academic performance and drop-out directly affect completion and attainment rates. A study on the initial academic major decision-making process has the potential to help students, families, and institutions understand the influences in the choice process so that interventions might be made where and when the benefits to college success can be maximized.

Outline of the Dissertation

The next chapter of this dissertation highlights literature most relevant to this study, provides the theoretical perspective that guides and informs the study, and introduces the variables considered in the examination of the two research questions. Chapter 3 describes the dataset used, details the measures employed, and explains the data analysis plan. Chapters 4 and 5 present the results of the secondary data analyses and a discussion of findings.

CHAPTER TWO: LITERATURE AND THEORETICAL PERSPECTIVES

Introduction

Information in this chapter is presented to situate the study in the broader body of literature on American college students and introduce the theoretical perspective guiding the study. The review of literature in this chapter begins with an overview of the advice and guidance students receive during the college choice process about major choice. The literature that follows will bring attention to factors related to academic major decision making and the importance of certain key student characteristics in the scholarly study of the American college student experience. The theoretical framework that guides this study on the initial academic major decision-making process will then be discussed and additional related frameworks will be presented. The chapter concludes with a description of the conceptual model for this study and the re-statement of the contributions that can be made by this study.

College Choice and the Academic Major

Selingo (2013) observed that students and family members make a decision about where the student should attend college based on fuzzy concepts of fit and value, concepts molded by marketing efforts of institutions, recommendations from friends, or magazine rankings. His observations of the influences on choice are supported by an often cited and researched model of student college choice - Hossler and Gallagher's (1987) Three Phase Model of College Choice. Hossler and Gallagher's three phase model is based on research that sought to explain factors that influence 1) what students thought about attending college and 2) where students

ultimately decide to attend college. The first phase, predisposition, is when students decide whether or not they will attend college. For students who decide to continue their education beyond high school the second phase, search, is when they will gather information about IHEs and settle on a set of institutions (a.k.a., search set) they consider a good fit with their college-related values. The third and final phase, choice, is when students narrow their search set and eventually come up with an answer to the question "Where am I going to enroll?"

Students know that when they apply to IHEs they will be asked about their academic interests. As such the choice of starting college with a declared major or none at all is often a consideration during both the search and choice phases of the college choice model. The search set and choice decision can be influenced not only by whether or not academic programs of interest, including the option to start college undecided about a major, are offered but also by the strength of academic programs (Broekemier & Seshadri, 1999). Additional considerations during the search and choice phase include admissions practices and academic policies, such as limited enrollment into certain majors and how easy (or difficult) it is for students to change majors after matriculation. Not only can students readily find on college websites, mass media articles, and college-related blogs advice on whether or not they should start college with a declared major, but guidance is also plentiful on what students can do to help them make this fundamental decision.

Advice on Indicating an Academic Interest

In general, not knowing what you want to major in when you start college does not negatively affect one's chances of admission (UNIGO, 2011; Webb, no date;

Wolf, 2010). That said, while what is indicated on the application is just a reflection of a preliminary academic interest, an applicant should make sure that their transcript demonstrates adequate preparation for the chosen major, and particularly limited access majors (UNIGO, 2011; Wolf, 2010). Applicants who are undecided in their major interests should not worry about being or falling behind those who declare a major, as some studies have shown comparable, if not higher, four–year graduation rates for those who are undecided upon matriculation (O'Shaughnessy, 2012; Webb, no date). As mentioned in Chapter 1, the undergraduate curriculum is an exercise in breadth and depth. Applicants choosing to declare a major based on subjects of interest in high school are advised to be cognizant that their interest may not be sustainable as they dive into major coursework (Driscoll, 2013). It is acceptable, and sometimes encouraged, for prospective students to keep an open mind and explore through the breadth of the general education requirements coursework not available in high school (O'Shaughnessy, 2012; UNIGO, 2011). As one dean of academic advising put it, "You've taken the same six subjects since kindergarten. If you don't know your major, don't come here and take the same subjects expecting to figure it out" (Simon, 2012).

Students who are undecided in their major are not always simply aimless, and those who declare a major are not always fully committed to their major (Spight, 2013). Although some undecided students are "profoundly undecided" as a result of not having any ideas on what to major in or strengths in any one particular subject, some students are undecided because of interests and abilities in multiple fields of study (Hoover, 2011; UNIGO, 2011; Wolf, 2010). Some of those who do select a

major do so because of related experiences during high school (e.g., coursework, part-time job, internship) or due to exposure to professionals in their fields of interest. Unfortunately, the "prematurely decided" students who declare a major based on bad information or parental pressure put themselves at risk to struggle in coursework due to a lack of fit between their interests, abilities, and values and their declared major (Hoover, 2011; O'Shaughnessy, 2012). Individuals who work on both the public and private side of college admissions and advising say there are advantages to both declaring and not declaring a major on a college application (Webb, no date). The consistently shared pieces of advice and guidance on picking a major (including undecided) are: 1) do what is right for you; 2) be true to yourself; and 3) make sure you not only have a genuine interest and passion in what you select but that your talents and abilities are also a fit (Burnsed, 2011; Kansas State University, 2013; Webb, no date; Wolf, 2010). Of utmost importance to the decision is the grounds upon which the decision is made (Spight, 2013).

Guidance on Deciding on Academic Interest

At a large public research university such as the University of Michigan, an applicant student could have upwards of 200 areas of study from which they could choose (Simon, 2012). What can a student do to pick the right major? Kansas State University boils the answer down to one sentence – the decision should be made based on an understanding of self and of all of the options available (Kansas State University, 2013). Enrolling in coursework, surfing the university website and course catalog, interning and shadowing, volunteering, participating in a club or organization, completing interest inventories and skills and values assessments, and

talking to others are all activities a student can engage in to make a more informed decision (Burnsed, 2011; Domingues, 2013; Driscoll, 2013; Green, 2012; Kansas State University, 2013; Tishgart, no date; University of Georgia, no date). Professors who teach in majors of interest, high school and college counselors and mentors, upper-division students in and recent alumni of majors of interest, and professionals in the field are all resources whose guidance will be based on direct experiences in specific fields of study.

The college choice process for students today begins earlier and is more sophisticated when compared to the experiences of students in the earlier half of the 20th century (Kinzie, Palmer, Hayek, Hossler, Jacob, & Cummings, 2004). Selingo (2013) argued that instead of looking for a college to attend, students "need to look for what and how [they] want to learn" (p. XVII). The previous section summarized the messages students receive not only about whether or not to declare a major on their college application, but also on what their decision can be based. The following section reviews the scholarly literature on the various factors related to students' decisions about what they want to learn in college.

Academic Major Choice

The scholarly studies on academic major choice almost always examine the choice of a specific major (e.g., pharmacy, accounting) or group of majors (e.g., science and engineering; humanities). In addition, studies typically examine a student's fit with the major using a person-environment fit perspective; the relationship between the chosen major and student's interests, skills, and knowledge; the influence of expectations related to long-term career decisions on the choice of

major; or differences in choice based on demographic identifiers such as sex and race. While this study does not examine major choice through the lens of person-environment fit, it does consider the variables studied by other scholars by capturing pre-college attitudes, beliefs, and behaviors specific to the decision to start college declared or undecided. This study examines influences in the initial academic major decision-making process for students in *all majors* and examines differences between groups of students based on sex and race/ethnicity. This review of literature begins with pre-college factors found to be related to academic major choice (i.e., parental influence and dispositions of the individual) and concludes with individual characteristics upon which differences have been found (i.e., sex and race/ethnicity).

Parents and Major Choice

The *Oxford English Dictionary* identifies the origin of the term "helicopter parent" to be in the 1980s at a time when parents of college students inserted themselves with increasing frequency in the daily lives of their students. More recently parental involvement has become a source of social capital that can influence educational opportunities and experiences (Perna & Titus, 2005). Family members are important to academic major decision making either directly through actions or indirectly through the social capital afforded the student (Beggs et al., 2008; Hwang & Vrongistinos, 2006; Hwang, Echols, & Vrongistinos, 2002). Firman and MacKillop (2008) found that the lack of "directive counsel" from parents and the lack of or dismissal of non-familial counseling were factors related to students' decisions related to their academic major. Goyette and Mullen (2006) found that the more education a student's parent(s) had achieved the more likely the student would select

an arts and sciences major over a vocational major. In two separate studies on the academic motivation of Asian American and African American students, researchers found that one in five students indicated that family influences were important to their academic major choice (Hwang & Vrongistinos, 2006; Hwang et al., 2002).

Student Dispositions and Major Choice

Research studies have documented the role of values and interests in academic major choice and persistence (Beggs et al., 2008; Goyette & Mullen, 2006; Keshishian, Brocavich, Boone, & Pal, 2010). A variety of national surveys (e.g., NCES and HERI instruments) ask students to rate the importance they place on things such as family, leisure time, and career and financial security. In studies of academic motivation, personal enjoyment of a major was most cited by students as an important reason for their academic major choice (Hwang & Vrongistinos, 2006; Hwang et al., 2002). Goyette and Mullen (2006) found that high income expectations and steady employment were negatively related to the choice of an arts and sciences major (e.g., humanities, science and math, social science), and students who valued leisure time were more likely to select an arts and sciences major over a vocational degree program.

Men, Women, and Major Choice

Researchers have found that women differ from men in pre-college characteristics and reasons for choice as related to academic major choice. Trusty's (2002) analysis of NELS:88 data found that for women course taking behavior in high school math classes was predictive of the choice of a science or math major. The reasons a student chooses one major over another can be based on perceptions,

expectations, and benefits of the major (Blakemore & Low, 1984; Seymour & Hewitt, 1997). When considering major choices, earnings differences were found by Wiswall and Zafar (2012) to be more important to men than women. Turner and Bowen (1999) found that the divide between the choice of majors in the life sciences and mathematics/physical sciences fields could be explained by how attractive the majors were perceived to be by men and women. The literature on the experiences of women in STEM fields readily acknowledges the role of the chilly climate and other environmental factors on their choice of and persistence in science, technology, engineering, and mathematics (STEM) fields. Shapiro and Sax (2011) identified a variety of factors, including the culture and teaching pedagogy in STEM departments, as predictors of interest in STEM majors for women.

Certain majors like engineering and education are commonly known and empirically proven to have differential enrollment by men and women (Bowen, Chingos, & McPherson, 2009; Goyette & Mullen, 2006; Pearson & Dellman-Jenkins, 1997; Simpson, 2001). Simpson (2001) found that for a sample of students from High School and Beyond that "sex of the student is one of the most powerful and robust determinants of choice of academic major" (p. 78). Female students in the study were five times more likely than male students to choose a health and life sciences degree program and four times more likely to choose a public service degree than a technical degree. Goyette and Mullen (2006) had similar findings in their study on the relationship between social background and academic major choice. The researchers used data from both the National Educational Longitudinal Study (NELS) and Baccalaureate and Beyond Longitudinal Study (B&B) to examine academic

major choice between arts and science (A&S) fields of study (e.g., humanities, science and math, social science) and vocational fields of study (e.g., business, education, engineering, pre-professional, other occupationally oriented disciplines). Among A&S majors, men in the study were more prone to select science and math disciplines while women were more prone to select humanities disciplines. As mentioned before, arguably more fundamental than the choice of a specific major is the choice to start college with a declared major. A study by Pearson and Dellman-Jenkins (1997) found that differences in this behavior existed between women and men such that 75% of the women in the study declared a major in the second year of study while only 68% of men had done the same.

Race/Ethnicity and Major Choice

Differences in academic major choice behavior also exist between different racial/ethnic groups. In terms of pure numbers of students in majors, Bowen, Chingos, and McPherson (2009) found that Black men are the least likely and Asian men are the most likely to choose majors in engineering, math, and physical sciences when compared to White and Hispanic male students. In a study that grouped academic majors differently, Goyette & Mullen (2006) found that African American and Hispanic students were more likely to choose vocational fields of study (e.g., business, education, engineering, pre-professional, other occupationally oriented) over Arts and Sciences majors (e.g., humanities, science and math, social science).

It is evident that academic major choice decisions vary based on sex and race/ethnicity. These differences are not unique to academic major choice but extend into many aspects of students' educational experiences. The following section

highlights how education is experienced differentially by men and women, and White students and students of color. These disparate educational experiences have the potential to mold influences on academic major decision making.

Sex, Race/Ethnicity, and Educational Experiences

Much attention is given to how educational experiences differ for female students and students of color when compared to male students or White students. For example, in a study of persistence in college using a sample of all students in all majors, Whalen and Shelly II (2010) found predictors of low persistence in college to include being female, being a minority, and starting college in a science, technology, engineering, or math (STEM) major. This section summarizes the differences found to exist between men and women and White students and students of color in pre-college characteristics (i.e., college readiness and standardized test scores), background characteristics (i.e., educational aspirations and parental involvement), and collegiate experiences (e.g., time to degree, rank in class). These differences reinforce the utility of including sex and race/ethnicity in the study of college experiences, as is done in this study.

Pre-college Characteristics: College Readiness and Standardized Test Scores

Issues of academic preparedness reflect structural systems such as the use of tracking in K-12 that differentially impact students (Carter, 2006; Syed, Azmitia, & Cooper, 2011). The 2012 report *The Condition of College & Career Readiness* ACT (2012) highlighted how ACT-tested high school graduates differ on the knowledge and skills needed for success in the first year of postsecondary education along six racial/ethnic categories (i.e., African American, American Indian, Asian, Hispanic,

Pacific Islander, and White). ACT looked at readiness in a variety of ways including meeting benchmarks in four categories (English, reading, mathematics, and science) and completion of a core high school curriculum. Asian students outperformed students in the other five racial/ethnic groups on both measures. Forty two percent of Asian students met all four benchmarks, in stark contrast to the only five percent of African American students who did the same. Asian students had the highest average ACT score not only in the 2012 administration but for each of the prior four administrations (i.e., 2008 to 2011). Arum and Roksa (2011) found similar differences in their study presented in their book *Academically Adrift*. When compared with students from Asian, Hispanic, or White racial/ethnic backgrounds, a greater percentage of African American students took no AP courses (45%), were in the bottom quintile in terms of high school grade point average (49%), and were in the bottom quintile in terms of SAT/ACT score (59%) (Arum & Roksa, 2011). These pre-college characteristics may influence students' thinking about and access to academic majors.

Background Characteristics: Educational Aspirations and Parental Involvement

Degree aspirations held in high school have been found to relate to degree attainment in adulthood. Individuals who aspired to obtain at least a bachelor's degree were found to more likely receive the degree by the age of 30 than individuals who did not aspire towards a bachelor's degree (Adelman, 1999). Similar to pre-college characteristics, degree aspirations may affect the post-secondary educational paths of students. Students who aspire to graduate degrees, for example, need to be informed of the links between undergraduate and graduate disciplines. Degree

aspirations have been found to differ between racial/ethnic groups. Among high school graduates who took the ACT in 2012, 54% of Asian students reported degree aspirations beyond the undergraduate level while the percentage of students in the other five racial/ethnic groups ranged from 30% to 37% (ACT, 2012).

Despite the negative connotations of helicopter parenting (Finkel & Fitzsimons, 2013), parents are important influences on the academic lives of students. Parental involvement varies, however, between men and women and between different racial/ethnic groups. In a study of over 10,000 students, Wolf, Sax, and Harper (2009) found higher levels of parental involvement and greater frequency of parental contact for female students and East Indian/Pakistani students. In the study, parental involvement included involvement in course selection, discussion of course material, interest in academic progress, and emphasis on good grades. The study also found students from some racial/ethnic backgrounds to experience disparate levels of parental involvement. Students who identified as Chicano/Mexican reported below average parental academic involvement but above average frequency of contact with parents (Wolf et al., 2009). In relation to this dissertation study, parental involvement can manifest itself in discussion about or selection of academic majors and emphasis on timely graduation

Key Collegiate Experiences: Cost, Interactions with Faculty, and Outcomes

Affordability continues to be a primary concern for students in the current economic landscape (Pryor et al., 2013). Financial aid policies influence different students in different ways (Carter, 2006), and are particularly important for certain groups of minority students. African American students who receive financial aid

have a substantially higher probability of college persistence and utilize grants and loans to a greater degree to cover college costs (Arum & Roksa, 2011; Carter, 2006; St. John, Hu, Simmons, Carter, & Weber, 2004). For low-income Hispanic and Black students a sufficient level of financial aid allows them to overcome background characteristics typically associated with non-completion of college – low parental education and low family income (Syed et al., 2011). To pay for college-related costs and/or to support family, some students may find themselves employed while attending school. Arum and Roksa (2011) found a majority of students (65%) are indeed working while in college. Of those who work the researchers found that African American and Hispanic students worked more hours per week than White students. Students with limited amounts of financial resources may be swayed from considering 5-year or 4+1 degree programs simply because of the increased cost of attendance.

Faculty members can play an important role in creating the inclusive and welcoming campus environments that are important to students' persistence (Carter, 2006). Such positive experiences with faculty in introductory coursework can lead students to select the faculty member's discipline, while negative experiences may cause a student to avoid the field altogether (Jaschik, 2013). Engagement with faculty has been found to differ between students of different racial/ethnic groups, however. Among the four racial/ethnic groups in their study, Arum and Roksa (2011) found that the likelihood of Asian students never meeting with a faculty member outside of class was double that of White students.

College outcomes such as grade point average, rank in class, and time to degree have also been found to differ between male and female students and White and students of color (Arum & Roksa, 2011; Bowen et al., 2009). Arum and Roksa (2011) found male students and African American and Hispanic students in their study had lower second-year college GPAs than their female and White peers, respectively. The lower grade point averages may be a reflection of students' course-taking patterns and the associated difficulty inherent in different courses. For example, female students in Arum and Roksa's (2011) study enrolled in fewer classes generally perceived to be hard (e.g., science and mathematics) and enrolled in more courses generally perceived to be easy (e.g., humanities and social sciences).

Representing a variety of disciplines and areas of study, the literature presented in the three previous sections supports the inclusion of pre-college factors (e.g., important referents) and grouping variables (i.e., sex, race/ethnicity) in the study. The chapter began framing the story of initial academic major decision making with an overview of the messages students hear during the college choice process about starting college with a declared major or as undecided, and how to go about making their decisions. The second section focused on factors found to be related to academic major choice and differential experiences based on identity. The third section reinforced the importance of sex and race/ethnicity in the examination of educational experiences, thus further supporting the use of these variables in the study.

The gap not addressed by many of these studies is the simultaneous consideration of these variables in the initial academic major decision-making

process, and specifically the use of multiple measures of each factor. The standard techniques used in past work (e.g., correlation, t-tests, ANOVA) are less informative in the examination of phenomena than the technique used in this study (i.e., binary logistic regression). For example, correlation analysis examines the relationship between two variables but does not account for the influence of other variables. Chi-squares tests examine whether or not groups respond differently on some variable, but again without necessarily accounting for the influence of other variables. An additional concern related to methodological weaknesses is the lack of the use of theory to ground a study (e.g., Cunningham & Smothers, 2010).

The following section describes the theoretical framework that grounds this study. Descriptions will include explanations of key constructs, theorized relationships between constructs, and a discussion of prior studies that have utilized the theoretical framework to explore educational outcomes. The section also includes an overview of related theoretical perspectives that could inform this study.

Theoretical Perspectives

This study draws upon Ajzen's (1991) Theory of Planned Behavior (TPB) to model pre-college influences in the academic major decision-making process. In contrast to other theories of college outcomes which provide a macro-view of student change behavior during college (e.g., Weidman's [2006] framework of organizational socialization of students in higher education), the TPB provides for the examination of the determinants of student behavior in a context–specific setting – initial academic major choice.

Ajzen's (1991) Theory of Planned Behavior

Icek Azjen's (1991) Theory of Planned Behavior (TPB) takes a dispositional approach to the prediction of human behavior and is conceptualized to not only predict human behavior but to also explain the determinants of human behavior. The TPB is an extension of Fishbein and Azjen's (1981) prior Theory of Reasoned Action (TRA). Both the TRA and the TPB model the direct relationship between intentions about a behavior and the performance of the behavior (see *Figure 1*).

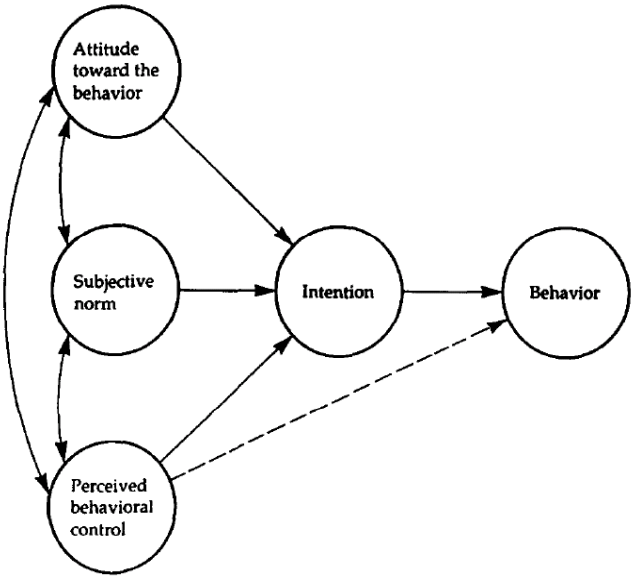

Figure 1. Icek Ajzen (1991) Theory of Planned Behavior.

Unlike the TRA, however, the TPB does not make assumptions about a person's sense of volitional control of the behavior (e.g., the ability to decide at will whether or not to perform the behavior). The TPB is an improvement upon the TRA because it incorporates a measure of control a person perceives him or herself to have over the performance of the behavior (i.e., perceived behavioral control). An individual's perception that a decision is up to them, according to the TPB, is molded by the perception of resources that can facilitate or obstacles that can impede the

performance of the behavior. Perceived behavioral control is modeled to have a direct relationship to behavior (see dotted path in *Figure 1*), as well as intentions to perform the behavior. In the TPB intentions reflect the amount of effort individuals are willing to put in to the performance of the behavior. The more effort an individual is willing to put towards the behavior, the more likely the behavior will be performed.

In addition to perceived behavioral control, two other distinct predictors of intentions are included in the TPB:

1. Attitude towards behavior – the degree to which a specific behavior is viewed positively or negatively, and
2. Subjective norm – the perceptions of societal pressures or messages about whether or not a specific behavior should be performed.

As the structural diagram in Figure 1 shows, these three constructs - attitudes, norms, and perceived control - are interrelated (i.e., influence each other) and also directly influence intentions to perform the behavior.

As previously mentioned, the TPB was conceptualized not only to predict human behavior but also explain what prompts people to do what they do. The prompts to behavior can be examined at the macro level of attitudes, norms, and behavioral control or at the micro level through the measurement of beliefs. Beliefs provide more detail about what prompts one person to do one thing and another person to do another thing. Beliefs: 1) influence attitudes by linking behavior to outcomes of the behavior; 2) place a level of importance on norm referents; and 3) reflect the presence or absence of resources and opportunities needed for an

individual to perceive that he or she has control over the behavior. These three types of beliefs - behavioral, normative, and control - are modeled as separate constructs directly related to either the construct attitudes, norms, or perceived control.

In summary, the TPB explains that human behavior is a result of an individual's intentions to perform a behavior and their perceived control over the performance of the behavior. One's intentions are molded by their evaluation of the performance of the behavior (i.e., attitude), external opinions on the performance of the behavior (i.e., norms), and the individual's perception of control over the decision, all of which are underpinned by distinct sets of beliefs. Azjen (1991) posits that the TPB can be useful in attempts to understand complex human behavior and that since each construct of the model reflects a particular aspect of the behavior interventions can be made to influence performance of the behavior.

TPB and prior research. The TPB has been used widely in the prediction of human social behavior (Ajzen, 2011). However, a search in EBSCO for "theory of planned behavior" and "college" resulted in only 40 peer-reviewed studies published in the last 15 years. Of the 40 studies only two examined academic-related behaviors. Over half of the studies utilized the TPB to predict health and wellness related behavior such as binge drinking and participation in exercise. Searches for "theory of planned behavior" and "university," and "theory of planned behavior" and "high school" had similar results. This study can add to the sparse body of literature on education-related outcomes grounded in the TPB, a theory widely cited in other disciplines.

One of the few studies utilizing the TPB in the examination of education outcomes is Davis, Ajzen, Saunders, and Williams's (2002) study of factors related to

high school completion. The study examined the factors that predicted high school graduation for a group of African American students in an inner-city high school in the Midwest. The analysis of the data using MANOVA showed that graduates differed from non-graduates in all three constructs of attitude, subjective norms, and perceived behavioral control. That is, the more favorable the attitude to remain in school and the stronger the perception of social pressure to remain in school, the more likely the student felt they had control over remaining in school. The study also found that those who graduated also had stronger intentions to stay. Measured variable path analysis of composite scores of direct and indirect measures showed that the three composites accounted for 51% of the variance in the intentions to stay, with the strongest path being perceived behavioral control. Students' intentions to remain in school and their perceived behavioral control accounted for 25% of the variance in graduating, with intentions being the stronger path.

While the study conducted by Davis and his colleagues (2002) utilized a sample of high school students, Tan and Laswad's (2009) longitudinal study grounded in the TPB examined the academic major choices, beliefs, and attitudes of business students enrolled in an introductory accounting class at a large multi-campus university in New Zealand. Data was collected in Year 1 and Year 3 of the study from the same cohort of students. The measured variable path analysis of differential scores found that attitudes and subjective norms were significant contributors to academic major intentions. They also found that academic major intentions and perceived behavioral control accounted for 32% of the variance in choosing accounting as their major three years later. The following two sections introduce

related theoretical perspectives that have been used in the study of major choice and can inform this study.

Lent, Brown, and Hackett's (1994) Social Cognitive Career Theory

Lent, Brown, and Hackett's (1994) Social Cognitive Career Theory (SCCT) pulls together the determinants and processes found in divergent models of career development into a framework conceptualized to model both academic and career decision making. The theory is grounded in general social cognitive theory (see Bandura, 1986) and emphasizes three social cognitive mechanisms in particular: self-efficacy, outcome expectations, and goals. SCCT describes the relationships between different person and contextual variables hypothesized to influence interest, goals, and actions related to academic and career decisions.

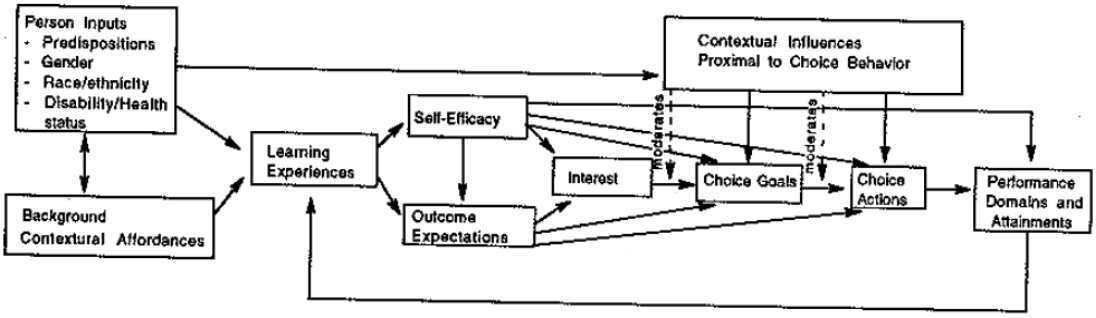

Figure 2. Model of career/academic choice process. From "Toward a Unifying Social Cognitive Theory of Career and Academic Interest, Choice, and Performance" [Monograph], by R. W. Lent, S. D. Brown, and G. Hackett, 1994, *Journal of Vocational Behavior, 45*¸ p. 93.

SCCT is a series of interlocking models of interest development, choice, and performance. The choice model (see *Figure 2)* is most related to this dissertation study as it delineates intentions from the actual behavior (i.e., goal versus action). Self-efficacy represents an individual's self-assessment of their capabilities to perform a behavior (e.g., confidence). Outcomes expectations are outcomes one

perceives to result from the performance of the behavior (e.g., jump into coursework of interest). Self-efficacy and outcomes expectations in combination mold interests, which in turn influence choice goals.

As seen in Figure 2, contextual variables are conceptualized to play a role in the academic decision-making process. These contextual variables can be distal (i.e., Background Contextual Affordances) or proximal to the choice goals and actions. Distal influences are antecedent to interest. Proximal influences, however, are conceptualized to directly influence choice goals and actions. In later iterations of the SCCT proximal contextual influences are conceptualized into two constructs: supports and barriers. A helpful high school guidance counselor is an example of a supportive proximal influence to initial academic major decision making. An example of barriers to the decision is the lack of support from family members.

SCCT and prior research. Nauta and Epperson (2003) grounded their longitudinal study of high school girls' choice of a science, mathematics, or engineering major (SME) in SCCT. Their final model accounted for 11% of the variance in SME major choice. The results of the study indicated a positive and significant relationship between math-science ability and high school SME self-efficacy. SME self-efficacy was positively related to interest in science, and interest, in turn, was related to SME academic major choice. One of the limitations of this study grounded in SCCT is that the model excluded the consideration of outcome expectations.

The utility of SCCT in capturing academic decision making has been tested by Lent and his colleagues in various studies of choice and persistence in science, engineering, and computing majors. Self-efficacy was found across four studies to be

significant in the prediction of one or more of the constructs of interests, goals, or actions (Lent, Lopez, Lopez, & Sheu, 2008; Lent, Brown, Schmidt, Brenner, Lyons, & Treistman, 2003; Lent, Brown, Brenner, Chopra, Davis, Talleyrand, & Suthakaran, 2001; Lent, Brown, Sheu, Schmidt, Brenner, Gloster, Wilkins, Schmidt, Lyons, & Treistman, 2005). Expectations of the outcomes related to the action were significant in predicting choice of a science major but not in the formulation of goals to persist in engineering or computing (Lent et al., 2001; Lent et al., 2005; Lent et al., 2008). The examination of the influence of the proximal contextual influences of barriers and supports found neither to be significant in the prediction of choice of a science major but interrelated and significant contributors to students' self-efficacy (Lent et al., 2003; Lent et al., 2005).

One key distinction between the TPB and SCCT is that the latter considers person inputs (i.e., sex and race/ethnicity) while the former does not. The importance of person inputs was discussed earlier in this chapter and supports the inclusion of these inputs into the conceptual model used in this study. The constructs of supports and barriers as proximal contextual influences are akin to the normative and behavioral beliefs and subjective norms included in the TPB.

Holland's (1985) Theory of Vocational Personalities and Work Environments

John Holland's (1985) theory of vocational personalities and work environments (a.k.a., theory of vocational choice, theory of career choice) originated in his experiences as a personnel clerk during World War II (Gottfredson & Johnstun, 2009). This person-environment fit typological model categorizes people and environments into one of six types – realistic, artistic, investigative, social,

enterprising, and conventional (RAISEC). The realistic typology is characterized by the explicit, ordered, or systematic manipulation of objects, tools, machines, and animals. The artistic typology is ambiguous, free, un-systematized and entails the manipulation of physical, verbal, or human materials to create art forms or products. The investigative typology entails the observational, symbolic, systematic, and creative investigation of physical, biological, and cultural phenomena in order to understand and control such phenomena. The social typology is characterized by the manipulation of others to inform, train, develop, cure, or enlighten. The enterprising typology entails the manipulation of others to attain organizational goals or economic gain. And lastly, the conventional typology entails the explicit, ordered, systematic manipulation of data (Holland, 1985).

People in each of the categories have their own set of attitudes and skills for interacting with their environment. Environments demand, reward, provide opportunities, and encourage values characteristic of the type to which it is most aligned (Gottfredson & Johnstun, 2009). Individuals, however, do not fall into one category only and instead may take on qualities of more than one Holland type. An individual's three-letter Holland code reflects the three Holland types (i.e., R, A, I, S, E, or C) with the highest scores on the Self Directed Search (SDS) assessment. The highest of the types is typically listed first and referred to as the high-point code (Boyd & Cramer, 1995).

The RAISEC framework, as it is also known, has been applied to interactions beyond the vocational arena to interpersonal relations such as roommate situations, marriage, and other interests and activities (Holland, 1996; Murray & Hall, 2001). It

is appropriate for the study of students' choice of academic major as one of the major assumptions of the theory is that people (i.e., students) are drawn to and flourish in environments (i.e., academic disciplines) that are similar to their type (Holland, 1996).

Holland's theory and prior research. Murray and Hall (2001) applied Holland's theory to analyze gender-related issues in both occupational categories and co-curricular activities. Previous studies referenced by Murray and Hall found higher results of realistic, investigative, and enterprising traits among men and prevalent traits among women to be social and artistic. Some of the results of their ANOVA study were consistent with prior research such that realistic activities appealing more to men and social activities are more interesting to women (Murray & Hall, 2001). In relation to occupational preference, however, Murray and Hall found evidence contrary to long established observations - men's and women's attitudes about investigative and artistic careers did not hold true and attitudes about enterprising careers were flipped.

Kivlighan and Shapiro (1987) examined the predictability of Holland high-point codes on benefits gained from a self-help career counseling intervention. Participants experiencing difficulty with career decisions were recruited from a learning skills class to participate in a treatment program which consisted of a vocational card sort, the SDS, and creation of an action plan (Kivlighan & Shapiro, 1987). The researchers found that students with realistic, investigative, or conventional high-point codes showed greater career maturity after the intervention than students with high-point codes of social, enterprising, or artistic. The

researchers speculated that interpersonally oriented career decision-making interventions may have been better suited for S, E, and A personality types.

Porter and Umbach (2006) incorporated personality type based on the RAISEC framework along with five other sets of independent variables (demographics, parental influence, academic preparation, future views of the academic career, and political views) in their study of major choice. The researchers found political views and personality to be consistently strong predictors of major choice. Students' major choices were found to be in corresponding environment models. For example, students with a high point social code are more likely to major in the social sciences or choose an interdisciplinary major. This finding is parallel to research conducted by Downey, McGaughey, and Roach (2009) who found that despite similarities between Management Information Systems (MIS) and Computer Science (CS) majors, MIS students were influenced more by personal relationships than their CS counterparts. Although this dissertation study does not incorporate personality factors, Holland's RAISEC framework could prove useful in the interpretation of influential factors in the decision-making process.

The next section presents a conceptual model of the initial academic major decision-making process that draws upon Ajzen's (1991) Theory of Planned Behavior. The dichotomous dependent variable is appropriate for analysis using binary logistic regression instead of techniques under the umbrella of structural equation modeling (SEM). While this study does not examine major choice through the lens of person-environment fit it does incorporate person inputs as found in

SCCT, which allows for the exploration of the relationship of such inputs on the factors and outcome of the model.

Conceptual Model

This exploratory study captures pre-college attitudes, beliefs, and behaviors specific to the initial academic major decision-making process within the context of the fundamental decision to start college with declared major or none at all. Similar to questions raised in the latter half of the twentieth century related to student college choice, this study considers influential referents, students' values, and actions taken in the academic major decision-making process. Based on the presentation of the theoretical framework that guides this study and the review of the literature, an explanatory conceptual model has been created to answer two research questions:

1. Which pre-college factors influence students' decisions to start college with a declared academic major or none at all?
2. Do the factors differ for different groups of students based on sex and race/ethnicity?

The theoretical framework that guides the conceptual model is the Azjen's (1991) Theory of Planned Behavior (TPB). The TPB was chosen not only because it is widely used in a variety of disciplines yet seldom used in the study of educational outcomes, but also because it reflects the simpler mindset of high school students. The conceptual model presented is a non-path analytic interpretation of the TPB that incorporates belief measures into the constructs, thus necessitating a renaming of three of the model's constructs (see Figure 3). Recall from the previous description of the TPB that the three types of beliefs –

behavioral, normative, and control – are constructs modeled separately from but directly related to the constructs of attitudes, norms, or perceived behavioral control. Consequently, the explanatory conceptual model conceptualizes the following constructs:

- Predisposition = measures of behavioral beliefs and attitudes
- Deference = measures of normative beliefs and subjective norms
- Volition = measures of control beliefs and perceived behavioral control

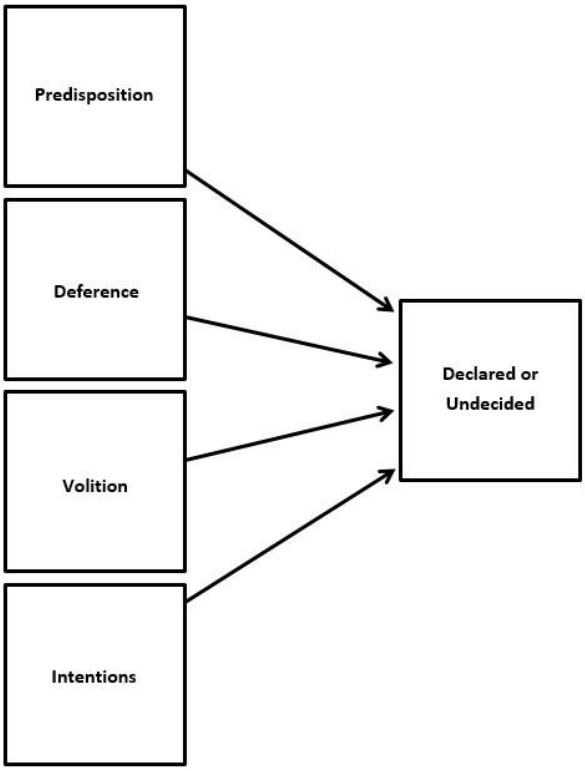

Figure 3. Conceptual Model examines factors in the initial academic major decision-making process. Based on Azjen (1991) Theory of Planned Behavior.

The behavior under study is starting college with a declared major or undecided. The initial academic major decision-making process includes influences of students' predisposition towards starting college with a declared major; the amount of deference they give to others' opinions about starting college with a declared major, the sense of volition (or control) over the decision to start college with a declared major, and their intentions (or efforts) towards the performance of the behavior.

Conclusion

Chapter 2 began with an overview of the advice and guidance students receive during the college choice process about major choice, followed by scholarly literature that focused on academic major choice. The literature presented supports the inclusion of variables chosen for the study and provides a backdrop to the contributions that can be made by this study. The use of a model appropriate for binary logistic regression will fill a gap in the current literature due to the combination of a context-specific theory of human behavior that incorporates internal and external influences. This study will add to the sparse body of literature that grounds studies related to educational outcomes in Azjen's (1991) Theory of Planned Behavior. The next chapter provides details about the dataset and measures to be used in this study of the initial academic major decision-making process, within the context of the fundamental decision whether to start college declared or undecided.

CHAPTER 3 - METHODS

Introduction

This chapter begins with the restatement of the purpose of the study and the research questions. The dataset to be used for this study will then be described in detail. A brief review of the study's conceptual model will serve as a guide to the description of the measures that follow. Person input variables (i.e., sex and race/ethnicity) and derived variables will also be described. The plan for data analysis will follow and includes a description of data cleaning and exploration decisions, and statistical techniques to be employed for the examination of the conceptual model. The chapter will conclude with considerations of the strengths and limitations of this study on the initial academic major decision-making process.

Purpose of the Study

The purpose of this exploratory explanatory study is to examine influences in the initial academic major decision-making process, within the context of the fundamental decision whether to start college with a declared major or none at all. This study examines the applicability of Azjen's (1991) Theory of Planned Behavior (TPB) to highlight the determinants of behavior in the academic major decision-making process, and utilizes binary logistic regression to gain a better understanding of the influences on academic major decision making. The research questions for this study are:

1. Which pre-college factors influence students' decisions to start college with a declared academic major or none at all?

2. Do the factors differ for different groups of students based on sex and race/ethnicity?

Participants

The secondary data was obtained from the on-campus housing department at a large public research I institution in the mid-Atlantic. The department collected the data for an on-going IRB-approved longitudinal research project on the experiences of students who live in the residence halls. One thousand students were randomly sampled from a population of 7,007 students who signed contracts to reside in campus housing in the spring of 2013 and had freshman or sophomore class standing. This sample size was appropriate for analysis at the 95% confidence level with a ±3% confidence interval. The usable return rate was 89% (n=891).

The sample is comparable to the population of students in the residence halls in terms of sex, race/ethnicity, and class standing. Forty-seven percent of the sample identified as female. The racial/ethnic composition of the sample is 56% White, 15% Black or African American, 15% Asian, and 6% Hispanic. The remaining 8% of the sample is comprised of smaller groups of participants who identified as American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, Unknown, Two or More, and Foreign. Thirty percent of the sample self-reported they matriculated undecided in a major. Almost one-third of the sample reported they considered three or more majors when applying to college. Forty percent of the sample indicated their specific major was one reason for choosing to attend their current institution. Similar to national HERI data (Pryor et al., 2012), 13% of the sample agreed with the statement, "I am strongly considering changing to another major."

Procedure

Staff of the on-campus housing department administered the paper-and-pencil survey to the students in the sample during the first two weeks of the spring 2013 semester, adhering to guidelines established in the IRB protocol. Students were informed by their resident assistant (RA) that they had been randomly selected to participate in the study. Participation was voluntary. Students were provided survey materials (i.e., survey, consent form to complete, and consent form to keep) in an unmarked envelope. To maintain the integrity of the data and voluntary nature of the process, students were instructed to seal the envelope when returning the completed consent form and survey to the RA. The RAs were instructed not to open sealed envelopes to confirm whether or not the materials had been completed. The survey took approximately 15 minutes to complete. In appreciation of their participation, students who returned sealed survey envelopes received one voucher for the on-campus game center (i.e., bowling, billiards, and arcade center).

Access to additional data points was granted by the institution's office of admissions and registrar. Staff of the on-campus housing department merged information such as high school grade point average and major indicated on application for admission with survey data. The researcher was provided remote access to a de-identified dataset to analyze for this study.

Target Behavior and Instrument

The decision-making process examined in this study involves the relationship of the constructs of predisposition, deference, volition, and intentions to the target behavior of starting college with a declared academic major or none at all. Since the

sample was comprised of students with freshman and sophomore class standing, the participants had to recall attitudes, beliefs, and perceptions held during the college application process (i.e., junior to senior year of high school). Consequently, throughout the survey respondents were instructed to think back to before they started college when responding to items related to pre-college factors. The sampling of only students with freshman and sophomore class standing was intentional on the part of the on-campus housing department in order to mitigate recall error related to pre-college experiences.

The survey contained six sections of 71 items that allow for analyses of a model based on Azjen's (1991) Theory of Planned Behavior. Additional items related to the academic major decision-making process were also included to serve as consistency checks against university-owned data (e.g., sex and race/ethnicity), to provide additional data points about students' decisions related to academic major (e.g., how many times the student had changed their major), and to capture major intentions of students who self-reported they were undecided upon matriculation. The survey instrument also included items for a separate study on academic major persistence (e.g., satisfaction with academic major).

Measures

To serve as a roadmap for the constructs and individual predictors, this section begins with a review of the conceptual model for this study (see *Figure 4)*. The conceptual model for this study is a non-path analytic interpretation of the TPB. Each construct in the model reflects a particular aspect of the performance of the behavior to start college with a declared academic major or none at all. Unlike some studies

that consider belief measures separate from more direct measures of attitudes, subjective norms, and perceived behavioral controls (Davis et al., 2002), the conceptual model used in this study incorporates beliefs into the constructs. Consequently, the TPB constructs are renamed predisposition, deference, and volition in the conceptual model. This study examines the influences of students' predisposition towards starting college with a declared major; the amount of deference students give to others' opinions about starting college with a declared major; the sense of volition (or control) students have over the decision to start college with a declared major; and students' intentions (or efforts) towards the performance of the behavior in the initial academic major decision-making process.

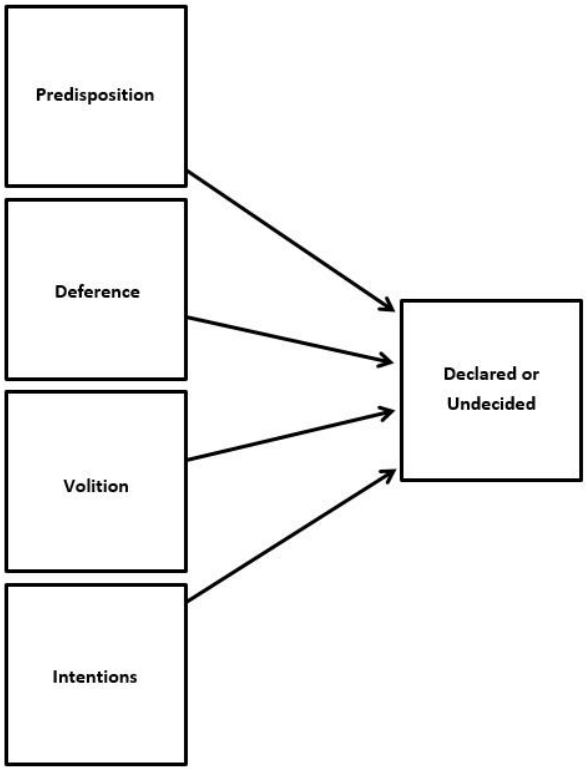

Figure 4. Conceptual Model examines factors in the initial academic major decision-making process. Based on Azjen (1991) Theory of Planned Behavior.

Predisposition

The predisposition construct includes the individual predictors of students' attitudes towards and beliefs about the outcomes related to starting college with a declared major. Attitudes towards starting college with a declared major are measured by a series of nine "evaluative semantic differential scales" (Davis et al., 2002), such as wise to foolish and desirable to undesirable. Each scale is measured by seven points. The original responses are reverse-coded so that students with higher scores on the individual predictor of attitudes hold a more positive attitude towards starting college with a declared major. The mean score of the nine differential scales is computed, resulting in one value of attitudes. Scores range from 0 to 7. The reliability of a similarly derived variable utilized by Davis and his colleagues is .82.

Behavioral beliefs are perceptions about the pros and cons of the performance of the behavior. They are assessed by ten statements to which participants were asked to indicate their level of agreement on a seven-point scale (1=*Strongly disagree*, 4=*Neutral*, 7=*Strongly agree*). Statements are based on analysis of college advising and career services websites and link the behavior under study to outcomes of the performance of behavior (e.g., "Starting college in a declared major would give me a sense of direction," and "Starting college in a declared major would allow me to graduate on time"). This item structure is consistent with the item structure used in other studies based on the TPB (e.g., "Completing the present school year will prepare me for college," in Davis et al., 2002). A principal components analysis

(PCA) of the belief items will determine if unidimensionality exists among the items. Sub-scales are derived as needed by summing across items.

Deference

The deference construct includes individual normative belief predictors derived from scores on the wishes of important referents and students' motivation to comply with the referents' wishes. Students with higher scores on the individual predictors of deference place greater importance on the opinions of others who believe the student should start college with a declared major. In the context of the initial academic major decision-making process, the proximal sources of pressures or messages about what to do are family members, high school staff and teachers, peers, and representatives of IHEs. Seven indicators for this construct are derived from 14 survey items. Survey participants were first asked if a particular referent thought it was important to start college with a declared major (i.e., strength of referent) and then asked how important the opinion of the referent was to them (i.e., motivation to comply with referent). This item structure is consistent with the item structure used in other studies based on the TPB (e.g., "My mother thinks I should complete the present year of high school," and "Generally speaking, I want to do what my mother thinks I should do," in Davis et al., 2002). As guided by Azjen's (1991) work, normative belief scores are derived by multiplying the responses of the two corresponding items. Scores range from 1 to 49. A principal components analysis (PCA) of the seven derived items will determine if unidimensionality exists among the items. Sub-scales are derived as needed by summing across items.

Volition

The volition construct includes two types of individual predictors - global measures of control and derived control beliefs. Control beliefs are the basis for one's overall perceptions about control and reflect the saliency of barriers that can make the behavior seem more difficult to perform or even inhibit the behavior (Azjen, 1991). Students with higher scores on the measures of volition felt less power over the decision whether to start college with a chosen major or none at all. This construct has 12 indicators total, ten of which are derived. The two global indicators of volition are measured on a seven-point scale. Students were asked how easy or difficult it was to make the decision, and their level of agreement to the statement that the decision was up to them.

The ten control belief indicators are derived from 20 survey items. Participants were first asked how true for them a particular factor was when making the decision to start college in a chosen major (i.e., existence of barrier) and then asked if that factor made the decision more difficult or easier to make (i.e., power of barrier on decision). Factors included having limited knowledge of a variety of majors and only having enough money for four years of college. This item structure is consistent with the item structure used in other studies based on the TPB (e.g., "Sickness [prevents me from attending school]," in Davis et al., 2002). As guided by Azjen's (1991) measurement guide, scores are derived by multiplying the responses of the two corresponding items. Scores range from 1 to 49. A principal components analysis (PCA) of the ten derived items will determine if unidimensionality exists among the items. Sub-scales are derived as needed by summing across items.

Intentions

Intentions is a single-predictor construct measured by a composite score of engagement in behaviors that reflect student effort towards starting college with a declared major. As discussed in Chapter 2, a wealth of information exists to guide students towards declaring a major for college. Students were asked if before starting college they utilized nine different resources or activities to research possible academic majors. Students were able to respond yes, no, or unsure. A value of 1 is assigned to each yes response. A value of 0 is assigned to each no response. Unsure responses are coded as missing and the values are imputed using the multiple imputation procedure. The mean of the nine academic exploration resources and activities (e.g., spoke with someone at college fair, surfed college websites, took related courses) is computed. Scores range from 0 to 1.

Declared or Undecided

The dependent variable used in this study is a dichotomous categorical variable derived from university-owned data points. Students who indicated a specific major on their application for admission (i.e., declared a major) are coded as 1. Students who did not indicate a major (i.e., undecided) are coded as 0. Major as indicated on the application is used instead of major upon matriculation or admission because some applicants were not admitted to their chosen major. Even though these applicants were admitted to the institution with undecided majors, their matriculation intentions upon submitting the application for admission was to enroll directly into a specific degree-granting program.

Grouping Variables

Analysis based on sub-groups will use data points obtained with permission from university-owned sources. Sex is a dichotomous variable with male coded 0 and female coded 1. The data point for race/ethnicity is derived by the institution to include race, ethnicity, and citizenship status. The nine categories of the original variable are: White, Black or African American, Asian, Hispanic, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, Unknown, Two or More, and Foreign. Due to small numbers of participants in some racial/ethnic categories, group differences will only be conducted for participants who identify as White, Asian, and are considered under-represented (i.e., URM). The URM group is based on the National Science Foundation's definition of URM and includes Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Hispanic or Latino (National Science Foundation, 2008). In this study students in the categories of Unknown, Two or More, and Foreign are combined into a category called Other. These cases are included in the full sample analysis but not analyses conducted for group differences.

Data Analysis

Data Cleaning and Exploration

The secondary dataset had already been cleaned by the on-campus housing department to exclude cases with significant amounts of missing data. Consequently, there is no concern of losing a large number of cases as a result of additional cleaning. There is also no concern with missingness of the additional university-owned data points merged with survey data since all data points were used by the

institution to determine admission to the university. In other words, all cases will have data as to whether or not a specific major was indicated on the application for admission. To protect the identity of the participants, the on-campus housing department merged survey data with the university-owned data into the final de-identified data file.

Concern for missing data lies in the loss of cases due to incomplete sets of data needed for the derivation of individual predictors. The multiple imputation (MI) procedure, which includes missing variable analysis (MVA), will be utilized to impute missing values. The MVA will provide information to determine if patterns exist within the missing data (e.g., random or non-random). The survey items under study are included in the MI procedure as predictors and values to be imputed. Demographic information such as sex and race/ethnicity as well as pre-college characteristics (e.g., high school grade point average, SAT score) are included in the MI procedure as predictors only. As discussed in Chapter 2, these variables have been found to be significant in various studies on education-related outcomes. The MI procedure will be employed on six different samples: the total analytic sample; separate samples of male and female cases; and separate samples of White, Asian, and URM cases. Other related steps in data cleaning and exploration will be to reverse-code items, collapse scales, re-code items as needed, and/or derive variables. Frequencies and descriptive statistics will be obtained on original and derived items to examine comparability and the performance of the MI procedure. Cronbach's Alpha will be calculated to determine the reliability of each construct or sub-scale, if needed.

For the statistical technique employed (i.e., binary logistic regression), analysis will be conducted to confirm analytic sample sizes, examine variability and normality of responses, and review correlations between items. While issues with the size of the analytic sample are anticipated, it is good practice to confirm that the dataset includes an ample number of cases per model specifications.

Statistical Techniques

Binary logistic regression (LR) and the test of equality of B coefficients are employed in the analyses of the datasets. Specifically, the equality of B coefficients test is utilized to examine differences between groups of students based on sex and race/ethnicity. SPSS 20 and 21 are used for the manipulation, descriptive analysis, and binary LR of the cleaned and imputed data.

Binary LR provides information about the relationship between the independent variables and dependent variables. Specifically, this statistical technique will provide information on the usefulness of sets of variables (i.e., constructs), as well as individual variables to the explanation of group membership: declared or undecided. To reflect the distinct TPB-based constructs the independent variables will be entered in separate blocks. Demographic variables are entered in the first block. The construct Intentions is entered as the fifth and final block. This decision is appropriate as Azjen's (1991) TPB conceptualizes Intention as a mediator between behavior and the constructs of attitudes, subjective norms, and perceived behavioral control (See Figure 1). The constructs used in this exploratory explanatory study – predisposition, deference, and volition – are entered as blocks two, three, and four, respectively, due to the proximal or distal relationship of the predictors to the

respondent. Measures related the predisposition construct reflect respondents' beliefs and attitudes and are bound to the student alone. Measures of deference reflect students' perceptions about proximal influential others. Lastly, measures of volition include barriers or supports external to and potentially not in the control of the student.

A binary LR is run on the total analytic sample for research question 1: Which pre-college factors influence students' decisions to start college with a declared academic major or none at all? Five additional binary LR models will be run using the sub-sample datasets for research question 2: Do the factors differ for different groups of students based on sex and race/ethnicity? Model fit for binary LR models can be determined by goodness-of-fit statistics such as the -2 Log Likelihood (-2LL), model χ^2, and pseudo R^2, as well as the proportion of cases correctly classified.

To determine if individual predictors are significantly different across groups, a test for the equality of regression coefficients is conducted to compare the B coefficients. The significance test utilized in this study is from the work of Paternoster, Brame, Mazerolle, and Piquiro (1998). Absolute values for Z that are greater than 1.96 (i.e., two-tail at $\alpha = .05$) indicate that a significant difference exists between the regression coefficients and that the predictors operate differentially for the two groups (Paternoster et al., 1998).

Delimitations

The first delimitation of this study is the adoption of a non-path analytic interpretation of Azjen's (1991) TPB. It should be noted that the original design of

this dissertation study conceptualized a path-analytic model more similar to Azjen's (1991) (e.g., includes latent constructs, endogenous and exogenous variables) and employed statistical techniques under the umbrella of Structural Equation Modeling (SEM) (Confirmatory Factor Analysis [CFA], Latent Variable Path Analysis [LVPA]). As a matter of fact, step one of a two-step SEM analysis was conducted using LISREL on the total dataset, as well as the sub-group datasets. Unfortunately, once analysis moved on to the second step, the software program simply crashed. Additional effort was made to analyze the data using Mplus, but attempts were futile. It was concluded that the dichotomous nature of the outcome variable under study was problematic for SEM but would be appropriate for analysis using binary logistic regression. Furthermore, some of the results of step one of the two-step SEM analysis on the CFA models supported or guided decisions made about the measures ultimately used in the binary LR model. For example, the model modifications suggested by LISREL indicated covarying errors for the three volition items related to encouragement and support. These three items were ultimately included in the volition sub-scale of encouragement and support.

The second delimitation of this study includes adding belief measures to the TPB constructs of attitudes, subjective norms, and perceived behavioral control resulting in the constructs of predisposition, deference, and volition. This decision is made not only to allow for more specificity in the examination of the experience but also for the examination of the effects beliefs have on the behavior. Recall in the TPB that beliefs are theorized to only relate directly to the constructs of attitudes,

subjective norms, and perceived behavioral control and not to intentions or the behavior under study.

A third delimitation of this study is the use of sub-scales (e.g., deference to family) instead of a single scale (e.g., deference). Similar to the first delimitation the desire for more specificity in the examination of the experience applies to this decision. If educators are interested in moving levers that matter the most, it is not enough to know deference to others is significant in the initial academic major decision-making process. It is additionally useful to know the source of the influence on the decision – family members, education authority figures, or peers. A finding that an all-inclusive scale score is significant in the explanation of group membership is not particularly useful. The evaluation of sub-scales will use DeVellis' (2003) ranges for coefficient alpha:

- Between .60 and .65 undesirable
- Between .65 and .70 minimally acceptable
- Between .70 and .80 respectable
- Between .80 and .90 very good
- Much above .90 consider shortening scale

Lastly, the decision not to include additional demographic variables or characteristics, such as first generation status, number of majors considered during college application process, and estimated annual family household income, is due primarily to the need for model parsimony due to the addition of beliefs measures. Although this deliberate potential mis-specification of the model may not be best practice for an explanatory design, concerns with the quality of these variables (e.g.,

accuracy of students' reports of estimated family household income) was of greater worry.

Strengths and Limitations

As with any study, there are strengths and limitations to this study. A significant strength of the study is that the secondary dataset includes variables consistent with the theoretical framework upon which the study is grounded. This mapping of measured items to conceptually modeled constructs allows for the testing of the model with less questioning about whether or not findings would be different if missing constructs were included. The reliability and validity of the constructs to be analyzed are enhanced as the items used in the data collection were either existing constructs used with permission or items based heavily on similar items already tested extensively by other researchers. The statistical techniques provide a more informed picture of the academic major decision-making process beyond what can be informed by correlation, ANOVA, or MANOVA.

Future directions for research include addressing potential model mis-specification concerns by including variables omitted due to model parsimony; sampling of non-residential students; collection of qualitative data to obtain information difficult to measure through quantitative measures; analyses based on specific majors or groups of majors; and the implementation of a true longitudinal design. The need for a true longitudinal design is related to a limitation of this study – the temporal nature of the data collection timeline. Ideally attitudes, beliefs, and perceptions held during the college application process (i.e., junior to senior year of

high school) would be captured during the process and not months later (i.e., first or second year of college).

The potential for memory error may influence the accuracy of the pseudo-longitudinal picture depicted by the findings. Memory recall of autobiographical memories can be reliable under some conditions, however, such as recall of recent experiences; salient and unique events, especially those lasting long periods of time; and experiences near "landmark" life events (Porter, Rumann, & Pontius, 2011; Schwarz, 2004; Tourangeau, 2000). This study utilizes secondary data that required respondents to recall memories likely no more than two years old; memories related to a set of specific experiences related to the unique broader event of applying to college; and memories near the landmark life event of high school graduation. Furthermore, recall is boosted when participants are cued by bounded time periods; when events and experiences are decomposed so as to increase respondents' access points to the memories; and when respondents are given time to recall memories (Beckett, DaVanzo, Sastry, Panis, & Peterson, 2001; Hassan, 2005; Tourangeau, 2000). Lastly, the self-response nature of the survey has potential for response bias, social desirability, and reflects more subjective and indirect measures, although university-owned data points do provide objective and direct measures.

Conclusion

This chapter began with the restatement of the purpose of the study, the research questions to be examined, and a description of the dataset. A re-introduction of the study's conceptual model served as a guide to the detailed description of the four constructs and associated individual predictors. The plan

for data analysis outlined the steps for data cleaning and exploration decisions, and identified binary logistic regression and equality of B coefficients testing as techniques to be employed for the examination of the conceptual model. The chapter concluded with delimitations of the study and considerations of the strengths and limitations of this study on the initial academic major decision-making process.

CHAPTER 4: RESULTS

Introduction

Results of the various steps taken in the analyses of the data are presented in this chapter. The chapter begins with a brief description of the analytic samples and the results of the multiple imputation procedure. Two sections will follow to provide results of descriptive and multivariable analyses. The descriptive analyses include demographic and pre-college characteristics, the independent variables modeled after Azjen's (1991) TPB, and the dependent variable for this study. The multivariable analyses will detail results of the binary logistic regression (LR) models and the comparison of B coefficients. The former will address research question 1 – "Which pre-college factors influence students' decisions to start college with a declared major or none at all?", and the latter will address Research Question 2 – "Do the factors differ for different groups of students based on sex and race/ethnicity?" The chapter will conclude with a summary of the results.

Analytic Sample Size

Although the administration of the survey garnered 891 usable surveys, 55 respondents were removed due to their matriculation date to the institution. Since the survey required participants to recall past experiences, in order to decrease error caused by memory recall, only students one or two years removed from the college application experience were sampled based on class standing (i.e., freshman and sophomore). Class standing, however, is determined by the number of credit hours earned and does not account for students taking time off from coursework. Of the 55 respondents removed from the dataset, 53 were three years removed and two were

four years removed from the college application experience (i.e., third and fourth year students). The final analytic sample is 836, of which 490 (59%) are one year removed and 346 (41%) are two years removed from the college application experience. A comparison cannot be made to the population as matriculation date was not available for the population sample.

Multiple Imputation Procedure

The multiple imputation procedure is a two-step process which analyzes the patterns of missing data followed by the imputation of missing values. The analysis of the patterns of missing values was conducted on the analytic sample prior to the derivation of new variables to determine the extent and nature of missing data that existed. The 64 variables used in the derivation of the independent variables were analyzed. All 64 variables had at least one missing value on a case, but no one variable was missing 5% or more. Of the 836 cases, 266 (32%) cases had at least one missing value on a variable. The number of values missing out of a total of 53,504 values was 1,182, or 2%. As such, cases with missing values were missing on average 4 of the 64 variables (i.e., 1,182/266). An examination of the patterns of missing values resulted in the conclusion that the data was missing completely at random (MCAR). Data that are MCAR have arbitrary patterns of missing-ness which do not depend on other values in the dataset (IBM Corporation, 2011).

Patterns analysis was also conducted on five additional sets of data used in the examination of Research Question 2 (i.e., differences between sub-groups). From the complete dataset of 836 cases additional datasets were created to include only the male, female, White, Asian, and URM student sample. Students in the Other

category are not included in the sub-group comparisons based on race/ethnicity due to the small size of the group. Summaries of missing values can be found in Table 1.

Table 1

Overall Summary of Missing Values by Sample

	Total (n=836)		Male (n=434)		Female (n=402)		White (n=477)		Asian (n=121)		URM (n=166)	
	n	%	n	%	n	%	n	%	n	%	n	%
Amount of Complete Data												
Variables	0	0	0	0	0	0	0	0	2	3	0	0
Cases	570	68	289	67	281	70	326	68	82	68	112	67
Values	52,322	98	27,151	98	25,171	98	29,928	98	7,583	98	10,345	96
Amount of Incomplete Data												
Variables	64	100	64	100	64	100	64	100	62	97	64	100
Cases	266	32	145	33	121	30	151	32	39	32	54	33
Values	1,182	2	625	2	557	2	600	2	161	2	379	4
Avg. missing	4		4		5		4		4		7	

Avg. missing = average amount of missing values for cases missing at least one value.

Since the LR model for this study used a number of derived variables, and 32% of the cases in the dataset are missing at least one value on a variable, the missing values were imputed to avoid the loss of cases in the analysis of data. An exploratory binary LR was conducted using the non-imputed dataset of 836 cases. The missing values would have resulted in a loss of 316 cases due to listwise deletion. The imputation of missing values was conducted on the total sample of 836 cases, as well as the sub-samples of male, female, White, Asian, and URM students. All missing values were successfully imputed in all six datasets. Each dataset included the original data and five additional sets of imputed data.

The concern that imputed values would replicate original data poorly is lessened since, on the whole, the amount of missing values was small (2%). The imputation procedure could draw from the 98% of non-missing data to generate the missing values. For safe measure, a comparison of descriptive statistics (i.e., mean, standard deviation) was conducted on the non-imputed and imputed datasets, and values were comparable. Unless otherwise noted, the descriptive and multivariable statistics in the following sections are based on pooled data. When not provided for pooled data, a statistic was derived by averaging values of the five imputed datasets (e.g., averaged pseudo R^2).

Descriptive Analysis

Sex and Race/Ethnicity of Analytic Samples

The total analytic sample includes 836 cases. Sex and race/ethnicity are used in the study as grouping variables for sub-group comparisons. The percentage of males (n=434) and females (n=402) in the sample is comparable to the percentage of males and females in the population (i.e., 52% and 48%, respectively). The total sample is comprised of 477 White, 121 Asian, and 166 URM students as well as 72 students categorized as Other based on the race/ethnicity data values of unknown, 2 or more, and Foreign. The percentage of White students in the sample is greater than the population by 2%, whereas the percentage of URM students in the sample is lower than the population by 4%. The percentage of Asian and Other students in the complete sample are comparable to the population. Table 2 shows the count and percentage for each demographic characteristic in each of the datasets utilized in this study.

An examination of the sub-group datasets revealed sex and race/ethnicity proportions to be a few percentage points off from the respective population groups. In the male sample the percentage of White students is 6% greater than in the male population, whereas the percentage of Asian and URM students were 1% and 5% lower, respectively, than the population. The proportion of Other students is the same in both the male sample and population. The percentage of White and URM students in the female sample are lower by 3 and 2 percentage points when compared to the female population. The percentage of Asian and Other students, however, is greater than what is found in the population by 3% and 2%. When comparing the number of men and women in each racial/ethnic sample to their respective population, the percentage of women was 3% lower in the White sample, 6% greater in the Asian sample, and 5% greater in the URM sample.

Table 2

Demographic Characteristics by Sample

	Total (n=836)		Male (n=434)		Female (n=402)		White (n=477)		Asian (n=121)		URM (n=166)	
Characteristic	n	%	n	%	n	%	n	%	n	%	n	%
Male	434	51.9					283	59.3	58	47.9	63	38.0
Female	402	48.1					194	40.7^{-}	63	52.1^{+}	103	62.0^{+}
White	477	57.1	283	65.2^{+}	194	48.3^{-}						
Asian	121	14.5	58	13.4^{-}	63	15.7^{+}						
URM	166	19.9	63	14.5^{-}	103	25.6^{-}						
Other	72	8.6	30	6.9	42	10.4^{+}						

+ greater than population
- less than population

Pre-college Characteristics of Analytic Samples

As discussed in Chapter 3, pre-college characteristics were used in addition to sex and race/ethnicity in the multiple imputation procedure as predictors only. Although these variables are not included in the binary LR model, the use of them in the generation of missing values in order not to lose 38% (i.e., 316 ÷ 836) of the cases in the total dataset warrants a description of the variables. The pre-college characteristics used in the multiple imputation procedure are the number of incoming credits transferred into the institution (0 to 65); high school grade point average (HSGPA; 0 to 5.000); score on the SAT (820 to 1600); and composite score on the ACT (16 to 35). No cases were missing values on the number of incoming credits, but 35 cases were missing values for HSGPA. Although 75 students had missing values on SAT score and 625 were missing values for ACT score, only 9 cases were missing both standardized test scores. Table 3 displays the mean and standard deviation of each pre-college characteristic of each analytic sample.

The only statistically significant difference in mean scores between male and female respondents is on the SAT score; with males having mean scores 47.6 points higher. For all four pre-college characteristics, URM students have lower means than all other racial/ethnic samples in the study. Asian students have higher means than all other racial/ethnic groups in both the number of incoming credits and SAT score. For these two same pre-college characteristics, White students had higher means than URM students but lower means than Asian students. No statistically significant mean differences existed between White and Asian students for the HSGPA and composite

ACT score. All of the aforementioned differences are statistically significant at the $p < .05$ level.

Table 3

Pre-college Characteristics by Sample

	Total		Male		Female		White		Asian		URM	
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Incoming Credits	15.1	12.8	15.4	12.7	14.8	12.9	15.8	12.3	21.7	13.7	8.6	10.4
High School GPA	4.0596	0.4569	4.0411	0.4692	4.0800	0.4426	4.1211	0.4133	4.2025	0.4025	3.7791	0.4719
SAT Score	1283.5	137.6	1305.7	128.1	1258.1	143.8	1312.1	114.0	1362.6	117.7	1145.9	116.3
ACT Composite	28.4	3.6	28.8	3.5	27.9	3.7	29.4	2.9	29.5	3.0	24.0	3.2

Measures of TPB Constructs

Following the Theory of Planned Behavior, this study on the initial academic major decision-making process conceptualizes behavior to be influenced by one's predisposition towards, deference to others about, volition over, and intentions related to the behavior of starting college with a declared major. The original language of the survey items can be found in the Appendix. Table 4 provides descriptions of the constructs and individual predictors. Table 5 maps the survey items to the constructs and individual predictors used in this study. Table 6 displays the mean and standard deviation of the individual predictors for each of the six samples.

Table 4

Description of Constructs and Individual Predictors

Construct	Individual predictor	Description
Predisposition		Evaluation of starting college with a declared major
	Attitudes	High scores = the more positive the evaluation
	Readiness beliefs	High scores = the more students believed starting declared represented readiness for college
	Negative consequences beliefs	High scores = the less students believed in potential negative consequences starting declared
	Direction beliefs	High scores = the more students believed starting declared gave a sense of direction
Deference		Influence of the importance other's placed on starting college with a declared major
	To family	High scores = the greater the influence of immediate family and other close relatives
	To education authority figures	High scores = the greater the influence of high school guidance counselor, high school teacher(s), or college representative(s)
	To peers	High scores = the greater the influence of high school classmates or close friends

Volition		Sense of power over the decision
	Difficulty	High scores = the more difficult the decision
	Control	High scores = the less control over the decision
	Money	High scores = the less power due to lack of financial resources
	Preparedness	High scores = the less power due to lack of preparedness to do so
	Encouragement and support	High scores = the less power due to a lack of encouragement and support from others
Intentions		Effort towards informed decision-making; greater mean = the more the student engaged in major exploration activities

Predisposition. Students' predisposition towards declaring a major on their college applications is conceptualized in this study to include both attitudes and beliefs about the behavior (i.e., behavioral beliefs). Beliefs undergird attitudes and are measured by linking behavior to outcomes of the performance of the behavior. Recall from Chapter 3 that the attitudes measure is derived by adding the reverse-coded responses of nine items such that the higher the score, the more positive the attitude. The averaged Cronbach's alpha measure for internal consistency among the nine evaluative semantic differential scales in the complete sample is .92. See Chapter 3 Delimitations for details of the evaluation of coefficient alpha values according to DeVellis (2003). This value, albeit acceptable, suggests this sub-scale could be shortened (i.e., include fewer items). A similar measure of attitudes used by Davis and his colleagues (2002) was computed by averaging scores on eight differential scales (range 2.25 to 7.00; $\alpha = .82$). An investigation of the dimensionality of the scale using Principal Components Analysis (PCA) indicated the attitudes measure is unidimensional. The mean of the attitudes score for the complete

sample is 50.5 with a standard deviation of 9.4. Across the sex and race/ethnicity samples the range of the averaged Cronbach's alpha coefficient is .90 to .92.

Ten items measure behavioral beliefs and the averaged Cronbach's alpha measure of internal consistency for these items in the complete sample is .73. Although this value is respectable for a scale (DeVellis, 2003), a subsequent analysis of dimensionality indicated the measure is not unidimensional. The PCA of the ten behavioral beliefs items extracted three components. Based on the component matrix, three behavioral beliefs subscales (i.e., individual predictors) were created by summing scores for items related to readiness beliefs, negative consequences beliefs, and direction beliefs (see Table 5). The averaged Cronbach's alpha measures of internal consistency for these subscales in the complete sample is .72, .59, and .77, respectively. Higher scores indicate students hold positive beliefs that declaring a major reflected readiness for college, were not deterred by potential negative consequences of declaring a major, and held positive beliefs that declaring a major reflected having a sense of direction.

Table 5

Map of survey items to constructs and individual predictors

Construct and Individual Predictor	Survey Items
Predisposition	
Attitudes	Useless to Useful
	Bad to Good
	Harmful to Beneficial
	Foolish to Wise
	Pleasant to Unpleasant
	Undesirable to Desirable
	Boring to Exciting
	Ill-prepared to Prepared
	Apathetic to Enthusiastic
Readiness Beliefs	Increase chance of being admitted

	Symbolize academically prepared
	Something to be proud of
Negative Consequences Beliefs	Waste of time because planned to change
	Require courses for which unsure if prepared
	Limit opportunities to explore interests
Direction Beliefs	Give a sense of direction
	Allow on time graduation
	Allow jump in to courses of most interest
	Give a sense of security knowing what studying
Deference	
To family	Members of immediate family
	Other close relative(s)
To educational Authority Figures	High school guidance counselor
	High school teacher(s)
	College representatives
To peers	Classmates
	Close friends
Volition	
Difficulty	Easy to Difficult
Control	Decision mostly up to me (reverse coded)
Money	Only enough money for four years
Confidence	Lacked confidence in self
Preparedness	Considered too many possible academic majors
	Lacked understanding of major(s) requirements
	Lacked academic skills for major(s)
	Lacked knowledge of strengths
	Lacked knowledge of variety of majors
Encouragement and Support	Lack of from:
	Family
	Teachers, staff, or administrators at my high school
	Friends
Intentions	Spoke with someone at college fair
	Spoke with someone during college campus visit
	Spoke with HS guidance counselor
	Surfed college websites
	Participated in related internship/work experience
	Interviewed graduate or current student
	Interviewed faculty member
	Took related courses

	Participated in related clubs or other extra-curricular activities

Deference. The construct deference reflects students' perceptions of pressures and messages from proximal sources about what to do. This study includes both subjective norms and normative beliefs in the construct of deference. Recall from Chapter 3 that the seven items in the deference measure are derived by multiplying the importance others place on the choice to apply to college with a specific major (i.e., strength of referent) by the importance the student places on the source (i.e., motivation to comply with referent). The higher the derived score, the stronger the influence of the proximal source on the student. Put another way, the higher the derived score, the greater the deference the student has towards the source.

The averaged Cronbach's alpha measure of internal consistency for the seven derived items in the complete sample is very good (DeVellis, 2003) at .89. Although a subsequent analysis of dimensionality indicated the measure is unidimensional a single deference score was not created so as not to lose the nuances of the various groups of proximal sources. Based on the content of the items three deference subscales were created by summing scores for items related to family, education authority figures, and peers as proximal sources of pressure or messages about initial academic major choice (see Table 5). The averaged Cronbach's alpha measures of internal consistency for these subscales in the complete sample are all very good (DeVellis, 2003): $\alpha = .80$, .83, and .88, respectively.

Volition. The power a student has over the initial academic major choice is reflected in the construct of volition. Both perceptions of control and control beliefs are included in the construct of volition for this study. Recall from Chapter 3 that two

global measures as well as ten derived items (i.e., control beliefs) are included in this construct. Control beliefs are the basis for one's overall perceptions about control and reflect the saliency of barriers that can make the behavior seem more difficult to perform or even inhibit the behavior. The ten items are derived by multiplying the saliency of barriers related to applying to college with a specific major by the influence of the barrier on the decision (i.e., barrier made decision easier or more difficult). The higher the derived score, the less volition the student has over the decision. Put differently, the higher the derived score, the more powerless the student felt in making the decision whether or not to apply to college with a specific major.

The averaged Cronbach's alpha measure of internal consistency for the ten derived items in the complete sample is .84. A subsequent analysis of dimensionality indicated the measure is not unidimensional as two components were extracted. Based on the component matrix and content of the items two volition subscales were created by summing scores for items related to preparedness to make the decision and encouragement and support from others to make the decision (see Table 5). Two derived items related to money for school and self-confidence were not included in the two subscales and remained in the construct as separate items. The averaged Cronbach's alpha measures of internal consistency for these subscales in the complete sample are both .80.

Intentions. According to college advising and career websites, students should put forth effort to engage in behaviors that allow them to make initial academic major decisions that fit their interests, expectations, goals, and abilities. Recall from Chapter 3 that the intentions measure is derived by taking the mean of

the nine academic exploration resources and activities. The greater the mean, the greater the effort students put towards the decision to start college with a declared major or none at all. The averaged Cronbach's alpha measure for internal consistency among the nine items in the complete sample is .64, which is less than the acceptable threshold of .70.

Table 6

Mean and Standard Deviation of TPB Variables by Sample

	Total		Male		Female		White		Asian		URM	
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Predisposition												
Attitudes	50.5	9.4	49.8	9.0	51.1	9.8	50.1	9.4	52.0	8.9	50.5	9.9
Beliefs												
Readiness	12.9	4.0	12.8	3.9	13.0	4.0	12.6	3.9	14.0	4.1	13.1	4.0
Negative Consequences	13.8	3.6	13.7	3.3	14.0	3.9	14.0	3.5	13.7	3.7	13.7	3.8
Sense of Direction	21.4	4.4	20.9	4.3	21.9	4.4	21.2	4.3	22.4	4.4	20.9	4.8
Deference												
Family	37.8	23.1	36.9	22.0	38.5	24.2	34.4	22.2	47.0	24.2	40.9	23.0
Educ. Authority Figures	43.6	27.2	43.9	26.6	43.1	28.0	42.3	27.4	48.1	28.2	44.3	26.3
Peers	28.7	20.5	29.3	19.7	28.3	21.5	27.2	20.3	34.8	21.7	29.4	20.4
Volition												
Difficulty	2.6	1.6	2.6	1.6	2.7	1.7	2.6	1.6	2.7	1.7	2.8	1.6
Control	2.1	1.6	2.1	1.6	2.1	1.5	2.0	1.6	2.0	1.5	2.3	1.8
Money	11.3	9.5	10.7	8.6	12.0	10.4	10.4	8.6	12.0	10.3	12.7	10.0
Confidence	10.6	9.6	9.9	8.9	11.3	10.3	10.0	9.3	12.4	10.3	10.5	10.0
Preparedness	56.2	37.6	53.6	34.5	58.9	40.5	52.3	34.8	64.3	38.0	59.2	44.8
Encouragement and Support	20.0	15.7	20.5	15.3	19.5	16.0	19.3	14.5	21.5	16.5	20.7	18.8
Intentions	0.565	0.231	0.563	0.240	0.568	0.223	0.558	0.233	0.598	0.234	0.567	0.214

note SD is average of 5 SD; average of 5 means equal to pooled mean

Dependent Variable

The dependent variable for this study groups respondents into two groups: those who applied to college with a specific major and those who applied as undecided. In the total analytic sample 746 (90%) students applied to a specific major and 90 (10%) applied as undecided. Even though 128 of the 746 students indicated an undecided major within a specific area of study, these cases were not deemed truly undecided as these students were able to narrow their major choice at the time of application to business (n=67), education (n=1), engineering (n=58), and agriculture and natural resources (n=2).

Within the separate analytic samples based on sex, 9% of males (n=41) and 12% of females (n=49) applied to college as undecided. White students had the highest percentage of undecided students (11%) when compared to other racial/ethnic groups, while Asian students had the lowest percentage (8%) of undecided students. Nine percent of URM students applied to college as undecided. When examining the differences in mean scores of pre-college characteristics, the only statistically significant difference was found in the number of incoming credits. Students who applied to college with a specific major had mean scores 4.1 points higher than undecided students on the number of incoming credits.

Table 7

Major as Indicated on Application by Sample

	Total		Male		Female		White		Asian		URM	
	n	%	n	%	n	%	n	%	n	%	n	%
Undecided	90	10.8	41	9.4	49	12.2	52	10.9	10	8.3	15	9.0
Declared	746	89.2	393	90.6	353	87.8	425	89.1	111	91.7	151	91.0

Multivariable Analysis

This study utilizes binary LR and comparison of B coefficients to answer the following two research questions:

1. Which pre-college factors influence students' decisions to start college with a declared academic major or none at all?
2. Do the factors differ for different groups of students based on sex and race/ethnicity?

Binary LR is appropriate for use in this study because the research questions seek to explain group membership and identify the relationships among variables. The following assumptions apply to LR:

- A linear relationship between independent and dependent variables need not exist.
- The dependent variable must be a naturally occurring, dichotomous outcome where membership is mutually exclusive and exhaustive.
- Independent variables need not be interval, normally distributed, linearly related, or of equal variance within groups.
- Large samples are needed due to the estimation procedures (Burns & Burns, 2008).

The assumption most problematic to this study is the assumption related to the requirement of large sample sizes. This assumption is met when analysis is conducted on the complete sample of 836, but may be violated when using the smaller samples. Some guidelines require, recommend, or suggest as few as ten and

as many as 50 cases per predictor (Burns & Burns, 2008; Warner, 2008). The smaller samples used in this study are close to meeting the minimum ten cases per predictor.

Binary Logistic Regression Model

The conceptual model for this study models four constructs in the initial academic major decision-making process. As such, block entry of predictors was done to regress applying to college with a specific major on the following groups of independent variables:

1. Demographics
2. Predisposition
3. Deference
4. Volition
5. Intentions

See Table 8 for the variables included in each group (i.e., block). The block entry binary LR model was employed for all six imputed datasets. In analysis conducted using sub-group samples, sex was removed from the model for male and female samples and race/ethnicity was removed from models for White, Asian, and URM samples.

Since research question 1 is not specific to a sub-group and asks about the experience of all students, the results presented in this section are based on pooled data from the complete dataset of 836 cases. Results not based on pooled data but derived using the results of separate imputations will be noted. The next section will detail the results for the sub-group samples.

Table 8

Variables by Block

Block Number	Variables
Block 1 – Demographics	Sex
	Race/Ethnicity
Block 2 – Predisposition	Attitudes
	Readiness Beliefs
	Negative Consequences Beliefs
	Sense of Direction Beliefs
Block 3 – Deference	To Family
	To Education Authority Figures
	To Peers
Block 4 – Volition	Difficulty of decision
	Control over decision
	Money
	Confidence
	Preparedness
	Encouragement and Support
Block 5 - Intentions	Mean of intention activities participation

The B coefficients, or log odds, of the independent variables are listed in Table 9. Log odds indicate the change in the average value of the dependent variable with every one unit change in the independent variable. The block by block presentation of the log odds illustrates how the values change as additional predictors are introduced to the model. Model fit for binary LR models can be determined by goodness-of-fit statistics such as the -2 Log Likelihood (-2LL), model χ^2, and pseudo R^2, as well as the proportion of cases correctly classified. The -2LL statistics measures how poorly the model explains group membership, with smaller values indicating better models. Significant model χ^2 values indicate the added predictors do add to the explanatory nature of the model. The Hosmer and Lemeshow (H-L) test can also be used as a measure of goodness-of-fit. A non-significant H-L χ^2 value indicates that the data fit the model well. Wuensch (2014) cautions against the use of

the H-L test, however, due to assumptions related to sample size and states that "even Hosmer and Lemeshow no longer recommend its use" (p. 9). As such, results of the H-L test will not be reported in the results. The Nagelkerke R^2 indicates the strength of the relationship between the dependent and independent variables. It is unlike the Cox and Snell R^2, which indicates the amount of variance in the dependent variable explained by the independent variables. The Nagelkerke R^2 is the most-often reported R^2 estimate due in part to it being a more reliable measure of variance explained (Burns & Burns, 2008). The overall percentage of cases correctly classified is another way to determine if adding predictors to the model adds to the ability to explain group membership. It is desirable that the overall percentage correct (OPC) increases as additional blocks of variables are introduced. Statistical significance is established at the $p < .05$ level.

It is necessary to note that unlike pooled parameter estimates (e.g., B coefficients, standard errors, Exp(B)) pooled fit statistics are not provided in the SPSS output. Fit statistics are only provided for each of the five imputed datasets. In this dissertation the reported fit statistics are computed by finding the averages of the values across the five imputed datasets and noted as *averaged* -2LL, χ^2, R^2, and OPC. This approach was taken under guidance by various online statistics forums (Taylor, 2011; van Ginkel, 2010) as there is a gap in the methodological literature regarding how to pool fit statistics (J. Harring, personal communication, September 2, 2014).

A binary LR model that includes the intercept only and no predictors would correctly classify group membership 89.2% of the time. The addition of demographic variables (i.e., block 1) does nothing to add to the explanatory nature of the model;

not only does the averaged OPC remain the same but neither the block nor averaged model χ^2 are statistically significant. Adding the TPB constructs of predisposition, deference, and volition (i.e., blocks 2, 3, and 4), however, increased the ability of the model to explain the relationship between independent and dependent variables. The averaged Nagelkerke R^2 increases from 0.02 in block 1 to 0.25 in block 4, indicating a relationship of 25% between the independent and dependent variables. Block 5, the intentions measure, also does not add to the explanatory ability of the model. The averaged Nagelkerke R^2 remains the same at .25 and the averaged OPC actually decreases by 0.2 percentage points. On the whole, blocks 2 and 4 contribute most to the explanatory nature of the binary LR model.

Table 9

Coefficients for Logistic Regression Model – Total Data

Variable	Block 1 - Demographics	Block 2 - Predisposition	Block 3 - Deference	Block 4 - Volition	Block - Intentions
Constant	2.231***	-2.883***	-2.846***	-1.238	-1.099
Female	-0.299	-0.366	-0.321	-0.265	-0.269
Asian	0.341	0.058	-0.154	-0.045	-0.018
URM	0.272	0.261	0.136	0.231	0.242
Other	-0.537	-0.605	-0.659	-0.626	-0.625
Predisposition					
Attitudes		0.050***	0.047***	0.034*	0.035*
Readiness Beliefs		0.203***	0.173***	0.177***	0.179***
Negative Consequences Beliefs		0.106**	0.109**	0.086*	0.086*
Sense of Direction Beliefs		-0.046	-0.054	-0.050	-0.050
Deference					

To Family			0.018*	0.019*	0.019*
To Education Authority Figures			-0.002	-0.001	-0.001
To Peers			0.005	0.005	0.005
Volition					
Difficulty of decision				-0.249**	-0.247**
Control over decision				-0.106	-0.106
Money				-0.014	-0.014
Confidence				-0.005	-0.006
Preparedness				-0.002	-0.002
Encouragement and Support				0.019	0.019
Intentions					-0.330
Avg. Block χ^2	6.51	79.51***	8.68*	17.26**	0.37
Avg. Model χ^2	6.51	86.02***	94.69***	111.95***	112.32***
Avg. -2LL	564.63	485.11	476.44	459.18	458.81
Avg. Nagelkerke R^2	0.02	0.20	0.22	0.25	0.25
Avg. OPC	89.2	89.5	89.1	89.6	89.4

* $p < .05$. ** $p < .01$. *** $p < .0001$.

The interpretation of the value of individual predictors to the model can also be made by the use of the odds ratio (i.e., Exp(B)). Whereas the B coefficient represents the change in the average value of the dependent variable with every one unit change in the independent variable, the odds ratio indicates the multiplicative change in odds of membership for every one unit increase in the independent variable. If the Exp(B) value exceeds one, then the odds of group membership (i.e., applying to college with a chosen major) increase. Exp(B) values of less than one indicate that the odds of group membership decrease. Furthermore, odds ratio values are also an indication of effect size that allows for the determination of relative

importance of the independent variables (Burns & Burns, 2008). The log odds as well as the standard error, p-value, and 95% confidence interval for the model where applying to college with a specific major is regressed on five sets of block entry variables can be found in Table 10. The Wald statistic and degrees of freedom (df) are not included in the table since the values are not provided for pooled data.

The statistically significant predictors are students' attitudes towards the behavior, beliefs about readiness and negative consequences, deference to family members, and difficulty of the decision. All of the variables except difficulty of the decision increase the odds someone will be classified as applying to college with a major. The more difficult the student found the decision to declare a major, the likelihood of doing so decreased by 0.781 times. For every unit increase in attitudes towards the behavior and beliefs about negative consequences, the odds a student would apply to college with a specific major was multiplied by 1.035 and 1.090, respectively. Positive beliefs about declaration of major as an indicator of readiness for college increased odds of declaring a major so that for every unit increase in the score the odds increased by 20%.

Table 10

Significant Individual Predictors – Total Data

					95% C.I.for EXP(B)	
	B	S.E.	Sig.	Exp(B)	Lower	Upper
Constant	-1.099	1.006	0.275	0.333	0.046	2.394
Female	-0.269	0.252	0.286	0.764	0.466	1.253
Asian	-0.018	0.413	0.965	0.982	0.437	2.207
URM	0.242	0.349	0.488	1.274	0.643	2.525
Other	-0.625	0.379	0.099	0.535	0.255	1.125
Predisposition						
Attitudes	0.035*	0.015	0.017	1.035	1.006	1.065
Readiness Beliefs	0.179***	0.041	0.000	1.196	1.105	1.295
Negative Consequences Beliefs	0.086**	0.040	0.032	1.090	1.007	1.180
Sense of Direction Beliefs	-0.050	0.034	0.137	0.951	0.890	1.016
Deference						
To Family	0.019*	0.008	0.025	1.019	1.002	1.036
To Education Authority Figures	-0.001	0.008	0.941	0.999	0.985	1.014
To Peers	0.005	0.010	0.607	1.005	0.985	1.025
Volition						
Difficulty of decision	-0.247**	0.080	0.002	0.781	0.667	0.914
Control over decision	-0.106	0.079	0.180	0.899	0.770	1.050
Money	-0.014	0.014	0.306	0.986	0.960	1.013
Confidence	-0.006	0.016	0.731	0.994	0.964	1.026
Preparedness	-0.002	0.004	0.545	0.998	0.990	1.005
Encouragement and Support	0.019	0.010	0.052	1.019	1.000	1.039
Intentions	-0.330	0.554	0.551	0.719	0.242	2.130

* $p < .05$. ** $p < .01$. *** $p < .0001$.

Sub-group Models

The final model for all students is significant at the $p < .001$ level. The same is true of the final models for the samples of male, female, and White students. The final models for Asian and URM students, however, are not significant indicating the model does not have significant explanatory ability.

Blocks found to be significant in the model for all students are block 2 predisposition, block 3 deference, and block 4 volition, with blocks 2 and 4 contributing most to the model. Sub-group analyses did not have the same results, with at the most two blocks and at least no blocks significantly contributing to the explanatory power of the model, depending on the sample (see Table 11). In both the male and female samples the construct of predisposition is significant, but deference is significant for men only and volition is significant for women only. Across the racial/ethnic samples no constructs of significance are shared. As a matter of fact, no predictors were significant in the model for URM students. Predisposition and deference are significant for White students (similar to male students). For Asian students only the construct of volition was significant.

Table 11

Goodness-of-fit indices by Block and Sample

	Total	Male	Female	White	Asian	URM
Block 0 OPC	89.2	90.6	87.8	89.1	91.7	91.0
Block 1						
Avg. Block χ^2	6.51	.70	4.73	1.31	.02	.15
Avg. Model χ^2	6.51	.70	4.73	1.31	.02	.15
Avg. Nagelkerke R^2	.02	.00	.02	.01	.00	.00
Avg. OPC	89.2	90.6	87.8	89.1	91.7	91.0

Block 2						
Avg. Block χ^2	79.51***	23.25***	63.7***	67.35***	8.43	8.22
Avg. Model χ^2	86.02***	23.95***	68.4***	68.66***	.845	8.37
Avg. Nagelkerke R^2	.20	.12	.30	.27	.16	.11
Avg. OPC	89.5	90.3	89.2	88.8	91.4	91.0
Block 3						
Avg. Block χ^2	8.68*	9.32*	4.16	9.66*	2.26	2.15
Avg. Model χ^2	94.69***	33.27***	72.59***	78.32***	10.72	10.52
Avg. Nagelkerke R^2	.22	.16	.32	.3	.19	.13
Avg. OPC	89.1	90.1	88.9	89.4	91.1	91.3
Block 4						
Avg. Block χ^2	17.26**	8.68	12.86**	7.04	14.0*	9.35
Avg. Model χ^2	111.95***	41.95***	85.45***	85.37***	24.70*	19.87
Avg. Nagelkerke R^2	.25	.20	.37	.33	.42	.25
Avg. OPC	89.6	90.4	89.1	89.2	92.6	91.8
Block 5						
Avg. Block χ^2	.37	1.39	.10	1.62	.04	2.31
Avg. Model χ^2	112.32***	43.33***	85.55***	86.99***	24.7	22.17
Avg. Nagelkerke R^2	.25	.20	.37	.33	.43	.27
Avg. OPC	89.4	90.2	89.0	89.4	92.6	91.3

For students in the male, female, and Asian samples difficulty of the decision to apply to college with a major is significant. The more difficult the decision, the more that the odds of declaring of major decreases (see Table 12). This predictor is the only significant predictor for the male sample (Exp(B) = .793), and has the greatest influence on the Asian sample (Exp(B) = .468) such that the odds of applying undecided doubles for Asian students with every unit increase. Two predictors are significant for White students but no other sub-group: attitudes and deference to family. For every unit increase in each predictor, the odds of declaring a major increase by 1.075 and 1.028 times, respectively. The odds of declaring a major

increase for female and White students for every unit increase in the predictor readiness beliefs. Positive beliefs about declaration of major as an indicator of readiness for college increased odds of doing so by 33% for women and 20% for White students. Not being deterred by the potential negative consequences of declaring a major increased the odds of doing so for female and Asian students by 14% and 46%, respectively, for every unit increase in the readiness beliefs predictor.

Table 12

Odds ratios (Exp(B)) by Sample

	Total	Male	Female	White	Asian	URM
Constant	0.333	.518	.113	.032	11.475	6.863
Female	0.764			.755	1.064	1.078
Asian	0.982	.888	.863			
URM	1.274	1.121	1.449			
Other	0.535	.680	.396			
Predisposition						
Attitudes	1.035*	1.044	1.029	1.075***	.952	1.007
Readiness Beliefs	1.196***	1.093	1.332***	1.197**	1.141	1.179
Negative Consequences Beliefs	1.090*	1.091	1.136*	1.062	1.459*	1.038
Sense of Direction Beliefs	0.951	.955	.933	.939	.853	1.033
Deference						
To Family	1.019*	1.027	1.009	1.028*	1.002	1.004
To Education Authority Figures	0.999	1.018	.989	1.004	1.036	.980
To Peers	1.005	.983	1.023	1.004	.986	1.028
Volition						
Difficulty of decision	0.781**	.793*	.724*	.937	.468*	.617
Control over decision	0.899	.823	1.000	.834	1.958	.814
Money	0.986	.981	.983	.981	.965	1.005
Confidence	0.994	.994	.997	.992	1.059	.950

Preparedness	0.998	1.003	.994	.995	1.003	1.007
Encouragement and Support	1.019	1.017	1.027	1.024	.971	1.026
Intentions	0.719	.424	1.320	2.654	1.189	.112

Even though a predictor is significant for one sub-group but not another does not mean that the predictors operate differentially. To determine if individual predictors are significantly different across groups, a comparison of the B coefficients is conducted using a test for the equality of regression coefficients. The significance test utilized in this study is from the work of Paternoster et al. (1998) and uses the following equation:

$$Z = \frac{b_{g1} - b_{g2}}{SE_{b-difference}} \quad \text{where} \quad SE_{b-difference} = \sqrt{SEb_{g1}{}^2 + SEb_{g2}{}^2}$$

Absolute values for Z that are greater than 1.96 indicates that a significant difference exists between the regression coefficients. B coefficients for the all of the samples are in Table 13. The results of the test for equality of regression coefficients Table 14 indicate that the regression coefficients for readiness beliefs are significantly different between male and female students. The regression coefficients for difficulty of the decision are significantly different between White and Asian students.

Table 13

B Coefficients by Sample

	Total	Male	Female	White	Asian	URM
Female	-0.269			-0.281	0.062	0.075
Asian	-0.018	-0.119	-0.148			
URM	0.242	0.114	0.371			
Other	-0.625	-0.386	-0.927			
Predisposition						
Attitudes	0.035*	0.043	0.028	0.072***	-0.049	0.007
Readiness Beliefs	0.179***	0.089	0.287***	0.180**	0.132	0.165
Negative Consequences Beliefs	0.086*	0.087	0.128*	0.060	0.378*	0.037
Sense of Direction Beliefs	-0.050	-0.046	-0.069	-0.063	-0.159	0.032
Deference						
To Family	0.019*	0.027	0.009	0.028*	0.002	0.004
To Education Authority Figures	-0.001	0.018	-0.011	0.004	0.035	-0.020
To Peers	0.005	-0.017	0.023	0.004	-0.014	0.027
Volition						
Difficulty of decision	-0.247**	-0.232*	-0.323*	-0.066	-0.760*	-0.483
Control over decision	-0.106	-0.194	0.000	-0.182	0.672	-0.205
Money	-0.014	-0.019	-0.017	-0.019	-0.036	0.005
Confidence	-0.006	-0.006	-0.003	-0.008	0.057	-0.051
Preparedness	-0.002	0.003	-0.006	-0.005	0.003	0.007
Encouragement and Support	0.019	0.017	0.026	0.023	-0.029	0.026
Intentions	-0.330	-0.859	0.277	0.976	0.173	-2.188
Constant	-1.099	-0.658	-2.179	-3.440*	2.440	1.926
Avg. Block χ^2	0.37	1.39	0.10	1.62	0.04	2.31
Avg. Model χ^2	112.32***	43.33***	85.55***	86.99***	24.74	22.17
Avg. -2LL	458.81	228.14	212.47	241.62	44.28	78.55
Avg. Nagelkerke R^2	.25	.20	.37	.33	.43	.27
Avg. OPC	89.4	90.2	89.0	89.4	92.6	91.3
OPC change	0.2	-0.3	1.2	0.3	0.8	0.4

Table 14

Equality of Regression Coefficients Test Between Samples

	Male-Female		White-Asian		White-URM		Asian-URM	
	SE b-diff	Z	SE b-diff	Z	SE b-diff	Z	SE b-diff	Z
Female			1.092	-0.315	0.760	-0.469	1.238	-0.010
Asian	0.839	0.035						
URM	0.739	-0.348						
Other	0.822	0.659						
Predisposition								
Attitudes	0.032	0.453	0.081	1.509	0.046	1.435	0.088	-0.641
Readiness Beliefs	0.087	**-2.284**	0.174	0.273	0.114	0.131	0.192	-0.171
Negative Consequences Beliefs	0.088	-0.467	0.176	-1.803	0.107	0.217	0.189	1.800
Sense of Direction Beliefs	0.072	0.325	0.176	0.548	0.092	-1.034	0.186	-1.031
Deference								
To Family	0.018	0.975	0.032	0.812	0.023	1.041	0.034	-0.064
To Education Authority Figures	0.017	1.769	0.028	-1.100	0.020	1.175	0.031	1.797
To Peers	0.022	-1.844	0.042	0.415	0.031	-0.771	0.048	-0.859
Volition								
Difficulty of decision	0.178	0.510	0.351	**1.978**	0.289	1.447	0.428	-0.648
Control over decision	0.170	-1.146	0.521	-1.639	0.216	0.109	0.541	1.621
Money	0.029	-0.062	0.046	0.363	0.040	-0.593	0.054	-0.753
Confidence	0.034	-0.085	0.073	-0.898	0.045	0.942	0.080	1.357
Preparedness	0.008	1.028	0.017	-0.474	0.010	-1.091	0.018	-0.188

Encouragement and Support	0.020	-0.468	0.040	1.323	0.026	-0.091	0.042	-1.309
Intentions	1.178	-0.964	2.425	0.331	1.822	1.737	2.826	0.836

|Z-score| > 1.96 (two-tail at $\alpha = .05$) are in boldface

Conclusion

A brief description of the analytic sample and results of the multiple imputation procedure opened this chapter. The remaining two sections provided results of descriptive and multivariable analyses. The multivariable analyses employed for this study are the binary LR and test for the equality of regression coefficients. The regression model regressed applying to college with a declared major on five groups of predictors. The results of the block entry binary LR model indicate that the overall model is significant but only three of the five blocks of predictors contribute to the explanatory power of the model: the constructs of predisposition, deference, and volition. Sub-group analysis produced different results such that the final model is significant for only male, female, and White students and not for Asian or URM students. Furthermore, depending on the sample, at the most two blocks and at least no blocks significantly contributed to the model. The five individual predictors significant in the model for all students are not also all significant for the sub-group samples of male, female, White, Asian, and URM students. Further analyses using the test for the equality of regression coefficients indicate that B coefficients for two predictors are indeed different between subgroups. A discussion of the results will follow in the next chapter.

Chapter 5: Discussion and Implications

The purpose of this study is to examine the influences of pre-college factors in the initial academic major decision-making process to gain a better understanding of what and who may be influencing students' decisions. To ground our understanding in the most basic facets of this process, this study scales the choice of academic major down to a fundamental decision that often precedes the selection of a specific major: whether to choose to start college with a declared major or none at all. Specifically, the researcher seeks to 1) identify which pre-college factors affect students' decisions to start college with a declared major or none at all, and 2) how factors differ for groups of students based on sex and race/ethnicity. A better understanding of these things can help institutions of higher education (IHEs) craft and emphasize certain messages about initial academic major choice, hone in on sources of influences on the decision, and address perceived barriers in the decision-making process. The conceptual model of the decision-making process is guided by Azjen's (1991) TPB, a theory designed to explain and predict human behavior. This chapter is broken into three sections: review of the problem statement and research design; summary and discussion of findings in the context of related scholarly literature; and implications for practice and research.

Restatement of Problem and Research Design

Students' initial academic major choice can expose them to socializing factors and resources that can facilitate or impede success in their first year of college. In discussing progress, retention, persistence, attainment, and completion very rarely do policy makers, administrators, and scholars discuss how students settle on a chosen

major in the first place. An understanding of the levers that influence initial academic major choice allows for interventions that may lead to choices which fit students' academic interests, expectations, goals, and abilities.

The research questions for this study are:

1. Which pre-college factors influence students' decisions to start college with a declared major or none at all?
2. Do the factors differ for different groups of students based on sex and race/ethnicity?

The secondary data used in the study has a final analytic sample size of 836 cases and is comparable to the population in the percentage of males and females, as well as the percentages of Asian and Other students. This study employs binary logistic regression (LR) to examine initial academic major choice as a dichotomous outcome - declared or undecided. The conceptual model for this study is an interpretation of Azjen's (1991) Theory of Planned Behavior (TPB) where the decision-making process under study includes students' predisposition towards, deference to others about, volition over, and intentions related to the fundamental decision whether to start college with a declared major or none at all. The incorporation of behavioral, normative, and control beliefs into these constructs allow for the examination of determinants of behavior that undergird students' perceptions related to their initial academic major choice.

Since the constructs used in the binary LR model include measures derived from multiple items, a multiple imputation procedure that includes missing variable analysis was conducted to avoid the loss of over 300 cases in the analysis. See Table

15 for the description of the constructs and individual predictors/sub-scales. Block entry of predictors was conducted to regress starting college with a declared major on the following groups of independent variables:

1. Demographics
2. Predisposition
3. Deference
4. Volition
5. Intentions

Table 15

Description of Constructs and Individual Predictors

Construct	Individual predictor	Description
Predisposition		Evaluation of starting college with a declared major
	Attitudes	High scores = the more positive the evaluation
	Readiness beliefs	High scores = the more students believed starting declared represented readiness for college
	Negative consequences beliefs	High scores = the less students believed in potential negative consequences starting declared
	Direction beliefs	High scores = the more students believed starting declared gave a sense of direction
Deference		Influence of the importance other's placed on starting college with a declared major
	To family	High scores = the greater the influence of immediate family and other close relatives
	To education authority figures	High scores = the greater the influence of high school guidance counselor, high school teacher(s), or college representative(s)
	To peers	High scores = the greater the influence of high school classmates or close friends
Volition		Sense of power over the decision

	Difficulty	High scores = the more difficult the decision
	Control	High scores = the less control over the decision
	Money	High scores = the less power due to lack of financial resources
	Preparedness	High scores = the less power due to lack of preparedness to do so
	Encouragement and support	High scores = the less power due to a lack of encouragement and support from others
Intentions		Effort towards informed decision-making; greater mean = the more the student engaged in major exploration activities

Summary and Discussion of Findings

The summary and discussion of findings is broken into two sections. The first section will summarize findings related to the two research questions, identifying the pre-college factors significant in students' initial academic major decision-making process and whether factors differ for groups based on sex and race/ethnicity. The second section will be a discussion of the findings within the conceptual framework and prior literature.

Summary

Research question 1. A full sample block-entry binary LR analysis reveals the constructs (i.e., blocks) of predisposition, deference, and volition to add to the explanatory nature of the conceptualized model on the initial academic major decision-making process. The construct intentions, however, is not significant and does not add to the ability of the model to explain why a student would make one choice over the other. Four individual predictors *increased* the likelihood the student chose to start college with a declared major and one individual predictor *decreased* the likelihood (see Table 16). The demographic variables included in the model, sex

and race/ethnicity, were not significant. The final model is significant at the $p < .001$ level and accurately classifies 89.4% of the cases.

Research question 2. When examining which constructs are significant among the five sub-sample models based on sex and race/ethnicity, the same three constructs (i.e., blocks) appear in several of the models: predisposition, deference, and volition. Not all constructs, however, are significant within each sub-sample model (see Table 16). No constructs are significant in the model for URM students. As a matter of fact, constructs found to be significant in the decision-making process for one racial/ethnic group are not found to be significant for another racial/ethnic group.

Table 16

Summary of Significant Constructs and Individual Predictors

Construct	Individual predictor	Total	Male	Female	White	Asian	URM
Predisposition		+	+	+	+		
	Attitudes	↑			↑		
	Readiness beliefs	↑		↑	↑		
	Negative consequences beliefs	↑		↑		↑	
Deference		+	+		+		
	To family	↑			↑		
Volition		+		+		+	
	Difficulty	↓	↓	↓		↓	

+ adds to explanatory nature of model
↑ increases likelihood of starting declared
↓ decreases likelihood of starting declared

Similar to the constructs, when examining which individual predictors are significant among the five sub-sample models, the same five indicators appear in

several of the models: attitude, readiness beliefs, negative consequences beliefs, deference to family, and difficulty of decision. The direction of the influence of each predictor echoes the effects found in the full sample model. As at the construct level, no individual predictors are significant in the model for URM students. The final model is significant at the $p < .001$ level for only the samples of male, female, and White students and accurately classifies 90.2%, 89.0%, 89.4% of cases, respectively.

Equality of B coefficients. Even though different groups have different significant predictors does this mean the predictors influence the decision-making process differently for each group (i.e., are they non-invariant over groups)? In order to know one conducts a test of equality of B coefficients where male students are compared to female students, White students are compared to both Asian and URM students, and Asian students are also compared to URM students. Regression coefficients for two individual predictors operate differently over groups (see Table 17).

Table 17

Summary of Significant Tests of Equality of B Coefficients

Individual predictor	Male	Female	White	Asian	URM
Readiness beliefs	+	++			
Difficulty			-	--	

+ change in average value of DV increased
- change in average value of DV decreased
++ change in average value of DV increased more than other group(s)
-- change in average value of DV decreased more than other group(s)

Discussion

The findings of this study indicate the potential usefulness of grounding studies of educational outcomes on the TPB as the theoretical framework. Each construct in the model reflects a particular aspect of the performance of the behavior to start college with a declared academic major or none at all. The results of the analyses shed light on significant influences, such family members and overall difficulty of the decision, in the initial academic major decision-making process. Analyses conducted on a full sample as well as sub-samples based on sex and race/ethnicity result in similar but not identical findings of significance in constructs and individual predictors. The additional sub-sample analyses underscore the importance of examining experiences for groups of students to better understand what and who differentially influences men and women, and White, Asian, and URM students in the initial academic major decision-making process. As will be discussed, one of the limitations of this dissertation study is the less than optimal sizes of the samples used to compare groups based on sex and race/ethnicity. Recall also that the potential for model mis-specification exists due to the omission of potentially useful variables (e.g., estimated family income) in this explanatory cross-sectional design. Consequently, the interpretation of any findings should be done with these limitations in mind.

Relationship to the theoretical framework. As presented in Chapter 2, Davis et al. (2002) and Tan and Laswad (2009) based their respective studies of high school graduation and choosing accounting as a major on the TPB. Both groups of researchers found attitudes, subjective norms, perceived behavioral control, and

intentions to be significant in their measured variable path models. With the exception of intentions, the findings of this study are analogous to the work by Davis et al. (2002) and Tan and Laswad (2009) in that the constructs (i.e., regression blocks) of predisposition, deference, and volition are found to be significant in the ability of the model to explain group membership. The similarities and differences in the way variables are measured in this study and studies conducted by Davis et al. (2002) and Tan and Laswad (2009) may affect the findings. Even though the conceptual model of this study incorporated beliefs into constructs, a closer examination of the individual predictors reveals that the studies conducted by Davis et al. (2002) and Tan and Laswad (2009) also included comparable measures of attitudes, subjective norms, and control in their models. For example, all three studies considered family members, education authority figures, and peers as important referents. Where the findings differ is also where the measurement differs: Davis et al. (2002) and Tan and Laswad (2009) measured intentions directly (e.g., "Do you intend to…?"), whereas this study used engagement in academic major exploration activities as a proxy for intentions (e.g., the amount of effort the student intended to put into the performance of the behavior). Recall also that the low coefficient alpha of the nine items ($\alpha = .64$) is below the acceptable threshold of .70. This may be due to the differences in the amount of effort involved in each major exploration activity. For example, less effort is involved in surfing college websites when compared to the effort needed to interview someone who taught courses in majors of interest. The response scale of these items (yes, no, and unsure) may have also been problematic in that this 3-point scale does not provide much variance in responses. An alternative response scale is

to inquire about frequency of engagement in these activities (e.g., how many hours did you participate in a related internship/work experience?). In addition, descriptive analysis in Tan and Laswad's study found parents' views more important to students than the views of career advisors and counselors, followed lastly by the views of friends. In this dissertation study, however, a comparison of mean deference scores for family, education authority figures, and peers reveals in terms of raw scores the most deference is awarded to education authority figures. The findings of this study support the continued application of Azjen's (1991) Theory of Planned Behavior beyond fields of inquiry in which it is commonly used (e.g., health behavior) to studies of education-related outcomes.

The studies conducted by Davis et al. (2002) and Tan and Laswad (2009) employed path analysis as the statistical technique instead of binary LR, as used in this study. Path analysis is a form of structural equation modeling that allows the researcher to examine causal relationships among variables based on *a priori* theory. The path analysis models used in these two studies allow for the specification of relationships between variables as conceptualized in Azjen's (1991) TPB: 1) attitudes, subjective norms, and perceived behavioral control have causal relationships to intentions, and 2) intentions and perceived behavioral control have causal relationships to behavior. Logistic regression, however, simply examines the effect of each predictor relative to all other predictors included in the model. In other words, in the binary LR models used in this study the constructs of predisposition and deference are examined for their direct relationship to the behavior under study. Despite the differences in the statistical techniques, one potential LR statistic of that

can serve as a point of comparison to path analysis models is the Cox and Snell R^2, which indicates the amount of variance in the dependent variable accounted for by the predictors. The variables included in the final LR model in this dissertation study accounted for 13% of the variance in the dependent variable. In the study conducted by Davis et al. (2002), students' intentions to remain in school and their perceived behavioral control accounted for 25% of the variance in graduating. In Tan and Laswad's (2009) study, intentions and perceived behavioral control accounted for 32% of the variance in choosing accounting as a major. Although not as high as the studies that employed path analysis, the variance accounted for by the binary LR model is a starting point in the examination of the initial academic major decision-making process.

This study builds a case for the use of more nuanced measures, such as the belief and deference subscales used in this study. Since a purpose of this study is to identify the levers that can be tipped in the academic major decision-making process, a narrower understanding of what and who influences students can guide the efforts of high schools and IHEs so that valuable resources are directed towards what makes a difference. For example, it is more useful to know that, among the proximal influences of family, education authority figures, and peers, the influence of family results in a greater likelihood the student will start college with a declared major.

Lastly, one key contribution this study makes to the body of literature that draws upon Azjen's TPB in the examination of education-related outcomes is the use of sub-sample analyses to examine differences between groups based on sex and race/ethnicity. The study conducted by Davis et al. (2002), for example, included

only African American students and male and female data were pooled since no differences were found in relationships among variables when separate analyses were conducted. This study supports the importance of conducting separate group analyses to determine if a baseline model that includes everyone actually represents anyone. With the increasing diversity on college campuses and continued attention to the experiences of underrepresented groups, the additional analyses point to the value of cutting data in a variety of ways to better understand not only the experience of sub-samples of students, but also the potential limitations of a full sample model.

Research question 1. The full sample model demonstrates that sex alone and race/ethnicity alone are not significant in the initial academic major decision-making process. These findings are somewhat counter to the literature presented in Chapter 2 which stated major choice differences were found in many studies to exist between men and women as well as students from various racial/ethnic backgrounds. For example, Goyette and Mullen (2006) found that African American and Hispanic students were more likely to choose vocational fields of study (e.g., business, education, engineering) over Arts and Sciences majors (e.g., humanities, science and math), and women were more likely to choose humanities majors whereas men were more likely to choose science and math majors. The findings that neither sex alone nor race/ethnicity alone were significant in this model challenges those working with students not to make assumptions of what kind of student is more likely to choose to declare a major or none at all based solely on sex or race/ethnicity. Actually, one demographic variable is significant in the model – the Other race category when compared to White students. Unfortunately, since the Other category includes

students who are foreign, multiracial, and unknown in race/ethnicity, this finding is impossible to interpret and therefore excluded from further discussion.

Three of the four individual predictors in the predisposition construct (i.e., regression block) are significant and increase the likelihood a student will declare a major: attitudes, readiness beliefs, and negative consequences beliefs. Students who believe in the beneficial outcomes of starting college with a declared major have formed overall positive evaluations of the behavior (i.e., attitudes) and thus are more likely to do so. But what are the specific outcomes they believe to be beneficial? According to Azjen (1991), individuals will make affective and evaluative judgments about the performance of a behavior. Affective judgments are those based on positive or negative feelings associated with the behavior. Evaluative judgments are those based on the costs and benefits of the behavior. The first set of beliefs found to be significant in explaining why a student would start college with a declared a major – readiness beliefs - tap into positive feelings a student may hold about the behavior (i.e., pride, symbolism) and the short-term benefit of college admission. The second set of beliefs – negative consequences beliefs – indicate students are not deterred by the costs of starting college with a declared major (e.g., limit exploration). Even though potential negative consequences did not deter students from declaring a major, given that 13% of study participants who declared a major indicated not understanding major requirements, one has to wonder if students are actually naïve of the consequences of their choice. The set of beliefs not significant in students' decision-making process tap into long term benefits of the behavior: on-time graduation, courses of interest, and direction and security in course of study. This

finding is useful for IHEs as these beliefs related to having a sense of direction are the very benefits touted on university websites (e.g., University of California Santa Barbara, University of Massachusetts Amherst) in efforts to influence the academic major decision-making process.

This study supports the body of literature on the influence of family (Firman & MacKillop, 2008; Hwang et al, 2002; Hwang & Vrongistinos, 2006). Students are indeed more likely to declare a major if they placed greater value on the opinions of family members who believed in the importance of starting college with a declared major. It is peculiar, however, that even though respondents awarded a greater amount of deference to education authority figures, such as a high school guidance counselor, high school teacher, or college representative, this individual predictor is not significant in influencing behavior. The non-significance of this item to explain whether a student would choose to start college with a declared major or none at all could be a related to smaller variability in the responses such that the effect was no effect. Furthermore, this finding underscores the importance of extending studies of academic major choice beyond simple descriptive statistics. If this study conducted only simple descriptive analysis, a potential incorrect conclusion could be made that education authority figures have more influence on students than family or peers.

The construct (i.e., regression block) of volition includes two global predictors of control as well as predictors that reflect resources or obstacles with the potential to make the decision under study easier or harder. Difficulty of the decision is a global predictor and is found to be the only significant individual predictor of this construct. Higher levels of difficulty in making the decision explained why a student would

choose to start college undecided in their major. It is inconclusive, however, as to why the decision is difficult. Students were asked if limited financial resources, lack of confidence, lack of support and encouragement, and inadequate preparedness to make the decision play a role in their decision-making process. None of these factors are found to be significant, and most students in the study found the decision easier than harder (i.e., mean score of 2.6 on a scale of 1=*easy* to 7=*difficult*). Yet when you look at the correlation between the individual volition predictors, a moderate positive relationship exists between the level of difficulty and having too many majors to consider, not knowing what the student is good at, and having limited knowledge of a variety of majors. Thus, further study is warranted to determine if a student's sense of powerlessness over the decision to declare a major could be related to a lack of preparation to make an informed decision.

The source of the lack of preparation is reflected in the proxy used for intentions to start college with a declared major. As mentioned in Chapter 2, in order to declare a major that is a good fit students are advised to put effort into engaging in major exploration activities to expose them to a variety of majors and assist them in gauging what they are good at. Even though intentions is not a significant determinant as to whether or not a student will declare a major, it is worthy to note that declared students who unequivocally found the decision difficult had statistically lower scores in their engagement of major exploration activities than peers who declared and found some ease in the decision (i.e., responded 1 through 6). In other words, these students potentially applied to college with a specific major without

putting forth any effort to engage in major exploration activities upon which to base their decision.

The following section discusses how constructs and individual predictors differ between groups based on sex and race/ethnicity. The use of separate samples for these analyses in effect create an interaction between the predictors and grouping variables upon which membership is based (e.g., male or female). This approach is more manageable than a single-sample approach with a plethora of interaction effects.

Research question 2. The findings of this study echo the body of literature that concludes differences exist between men and women, and students of different racial/ethnic backgrounds when it comes to academic major decision making (Bowen et al., 2009; Goyette & Mullen, 2006; Simpson, 2001; Turner & Bowen, 1999). Specifically, this study finds differences exist in the pre-college influences in the decision but not the decision itself. That is, sex or racial/ethnic identity alone do not explain if a student is more or less likely to declare a major. The additional understanding of predictors related to the constructs of predisposition, deference, and volition, however, can provide a broader picture of the factors at play as all of these constructs (i.e., regression blocks) add to the ability of the model to explain why a student declares a major or chooses to be undecided about their major. The nature of these differences are discussed below.

Ironically, the findings of the sub-sample analyses inform more about what induces behavior among White students (i.e., the majority) and provide no information about what makes a difference in the decision-making process of URM students. Neither constructs nor individual predictors are significant in the model

analyzed using the sub-sample of URM students. These results may be a product of survey responses from a heterogeneous group of students who are artificially grouped together for no reason other than they are considered underrepresented. This grouping potentially dampens the influence of individual predictors that would otherwise be found to be significant.

Three individual predictors are significant in increasing the likelihood a White student will declare a major: positive attitude towards declaring, holding beliefs that declaring a major is a reflection of readiness for college, and higher levels of deference to family. The combination of these predictors calls into question the role of cultural or social capital in the formation of these attitudes and beliefs. Cultural and social capital are obtained through experiences typically associated with groups of privilege or power. Historically White students have participated in IHEs at a greater rate than students of color. As such, White students may have greater exposure to the positive evaluation of declaring a major simply because they are more likely than students of color to have immediate family members and other close relatives who have attended college and can pass along knowledge. Furthermore, since concerns about access, progress, and completion rates for students rarely include the experience of White students, it is possible that White students view themselves as different from those who may not be ready for college. The potential role of cultural or social capital in academic major choice is supported by Simpson (2001) who found cultural capital to be significant in the major choice for White students.

Only two individual predictors are significant for the Asian students, even though this group of students have higher mean scores on all but four individual predictors in the model. Asian students who were not deterred by the potential negative consequences of starting college with a declared major are more likely declare a major. Is this because on average Asian students are more academically prepared? In this study, this could very well be the case as the Asian students have statistically significant higher SAT scores than the samples of White and URM students. Are Asian students not deterred by potential costs because they are confident in their choice of major and/or not interested in exploring? This too could be true as the Asian students in this study also have a statistically significant higher number of incoming credits than the samples of White and URM students. The greater number of incoming credits suggest that Asian students are engaging in an activity that can assist in the academic major decision-making process: enrolling in college-level coursework during their high school years. The result of this additional coursework may be a more confident major choice. These differences in pre-college characteristics follow the findings of a report by ACT (2012) that Asian students outperformed students in five other racial/ethnic groups on benchmarks in English, reading, mathematics, and science, and completion of a core high school curriculum. Difficulty of decision is also significant for Asian students such that greater difficulty decreased the likelihood to declare. The reasons for the difficulty experienced in making the decision are unclear, however, as no other volition items are found to be significant. The difficulty experienced may be related to the higher mean scores Asian students have on intentions. These students exerted more effort to engage in

major exploration activities and may find the decision difficult because they have too many interests. As we consider these findings, however, it is worth a reminder that the final binary LR model was not statistically significant for Asian students. Although the model did not have statistically significant explanatory ability, some practical utility could be made of the significance of individual predictors.

Like Asian students, women less deterred by the potential costs of starting college with a declared major are more likely to declare a major. Could the aforementioned theory—that sufficient academic preparation lends itself to not being deterred—apply to women? Probably not as the sample of women in this study have lower test scores, lower HSGPAs, and a fewer number of incoming credits when compared to their male counterparts. A reasonable explanation for this finding may have to do with the major choices of women. Women are more likely than men to major in the social sciences and non-technical degree programs (Simpson, 2001). The women in this study may not be deterred by the potential costs of declaring a major, such as limited opportunities to explore, because their specific major choice (e.g., education, psychology) may afford more flexibility to explore other interests.

Equality of B coefficients. The test for equality of B coefficients reveals two individual predictors are non-variant across some groups (see Table 16). These two previously discussed individual predictors (i.e., readiness beliefs and difficulty of the decision) operate differentially between groups such that with every unit increase in the predictor, the change in the average value of the DV *increased more* or *decreased more* for one group than the other. High scores on readiness beliefs increased the average value of the dependent variable more for women than for men. High scores

on difficulty of decision decreased the average value of the dependent variable more for Asian students than White students. The difference in how readiness beliefs operates for male and female students could be attributed to female students self-identifying more strongly with the affective judgments (i.e., judgments based on positive or negative feelings associated with the behavior) related to this sub-scale. Since the reason(s) Asian students experienced difficulty in making the decision to start college with a declared major are unclear, it is challenging to speculate as to why difficulty of decision operates differentially for White and Asian students.

Limitations

The use of a secondary dataset binds a researcher to the data available and has the potential to place limitations on a study. Such is the case with this study in that the quality of some variables is questionable (see Chapter 3, Delimitations); only the experiences of students who live on campus are considered; sample sizes force analyses-related decisions that may not be optimal; and error may be introduced due to the design of the secondary data collection. Recall that this study involves the examination of influential others (e.g., family), as well as factors that make the decision troublesome (e.g., limited financial resources). The influence of others and presence of factors may differ for students who choose to live on campus and those who do not simply because of the characteristics of each group of students. In studies conducted by Pike and Kuh (2005) and Kuh, Gonyea, and Palmer (2001), students who lived off campus were more likely to be first-generation college students and working more hours than their on-campus counterparts. As such, these students may have family members with limited knowledge of the academic major decision-making

process, or have more salient financial concerns. A limitation of this study is the potential that the findings may not depict the experiences of off-campus students who may respond to survey items differently based on demographic and background characteristics.

Binary LR assumes large sample sizes. Guidelines indicate a minimum ten cases per predictor with the suggested number of 30 or 50 cases per predictor (Burns & Burns, 2008; Warner, 2008). Although the number of cases is adequate for both the full sample[1] and White student models[2], another limitation of this study is that the number of cases in the secondary dataset may not be sufficient for all analyses used to examine group differences. Although the size of the male[3], female[4], and URM[5] students samples do not reach the suggested cases per predictor, the minimum threshold of ten cases per predictor is met. The sample size of Asian[6] students approaches the minimum but does not meet the suggested cases per predictor. Although a higher *p*-value is used ($p < .05$) in this study due to sample sizes, it is still wise to consider the sample sizes when interpreting the findings or extending the findings beyond this study.

The secondary nature of the dataset also required the combination of Black or African American, Hispanic, American Indian or Alaska Native, Native Hawaiian or

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[1] Full analytic sample includes 836 cases and 18 predictors in model; analysis calls for 180 cases minimum, 540 to 900 cases suggested.

[2] White analytic sample = 477 cases and 15 predictors in model; analysis calls for 150 cases minimum, 450 to 750 cases suggested.

[3] Male analytic sample = 434 cases and 17 predictors in model; analysis calls for 170 cases minimum, 510 to 850 cases suggested.

[4] Female analytic sample = 402 cases.

[5] URM analytic sample = 166 cases.

[6] Asian analytic sample = 121 cases.

Other Pacific Islander students into one racial/ethnic group – underrepresented minority. With continued focus on the experiences of underrepresented students in higher education, it would have been preferable to retain keep Black or African American and Hispanic students as their own categories. With this said, the use of the URM category did allow for the inclusion of very small groups of students such as American Indian or Alaska Native and Native Hawaiian or Other Pacific Islander students, who otherwise would have simply been excluded from the study.

The cross-sectional design of the secondary data collection makes the study susceptible to misclassification due to recall bias. In addition, the cross-sectional data do not capture environmental factors that may influence student responses. For example, students who participate in discipline-based living learning programs were likely already exposed to socializing forces and resources that can impede or facilitate success. It is possible that a student who is satisfied with their major choice recalls their initial academic decision-making process more fondly than a student who is unsatisfied.

Lastly, binary LR as a statistical technique does not analyze the relationships between variables as theorized in Azjen's (1991) TPB. While appropriate, LR does not allow for the specification of direct and indirect relationships between constructs. Specifically, the theoretical framework specifies that attitudes, subjective norms, and perceived behavioral control covary, and each directly influence intentions. Furthermore, intentions and perceived behavioral control directly influence behavior. Other more powerful and advanced statistical techniques such as those in the

structural equation modeling family could more accurately model the theorized relationships.

Implications for Practice and Research

The purpose of this study is to examine influences in the initial academic major decision-making process in order to better understand what weighs most on the minds of students when making the decision to start college with a declared major or none at all. Azjen's (1991) TPB is an appropriate theoretical framework to guide this study as it was conceptualized to explain behavior. According to the TPB the constructs in the model represent different aspects involved in the performance of the behavior. An understanding of the influences of these aspects allows IHEs to design and implement interventions such that college-bound students can make initial academic major choice decisions that fit their interests, expectations, goals, and abilities. These interventions can benefit both the consumers and providers of higher education, both of whom are keenly interested in timely degree completion.

In examining factors that induce one student to make one decision and another student to make another decision, the specific levers found to be significant in the initial academic major decision-making process are 1) positive attitudes about starting college with a declared major, 2) family members who believe in starting college with a declared major and the importance of those family members to the student, and 3) how difficult it was for the student to make the decision. Furthermore, the beliefs upon which positive attitudes are formed tap into positive feelings about the choice to start college with a declared major, immediate benefits of the decision, and the dismissal of the costs of starting college with a declared major. These findings may

allow IHEs to better or more accurately hone the messages they send to college-bound students. This study also has the potential to guide the development of practices and policies to help students make informed decisions related to academic major choice. Since this study does not argue that starting college with a declared major is better than being undecided, the implications for practice will address general ideas based on the findings.

The findings suggest that messaging makes a difference in molding students' predisposition towards starting college with a declared major or undecided about a major. Although IHEs are developing more guided curriculum for students undecided in their major (e.g., University of Florida's multiple undecided tracks), this study suggests students pay more attention to the positive feelings and immediate benefits associated with declaring while also dismissing the potential costs. If we want students to make a choice that fits their interests, goals, and abilities, there appears to be a need to convey more effectively the reality of the costs of a given choice (especially one that is a poor fit with students' academic abilities) and the long term benefits of an informed choice. Both of these notions can apply to students who want to declare a major on their college application or are undecided about their major. In addition to messaging, this study is consistent with other research in that family members are an important additional target audience of the efforts of IHEs to influence the decision-making process. Student development theory informs us that, at the age when students are applying to college, the people considered to be authority figures by traditional-aged college students are typically family members. It is possible for high schools and IHEs to actively engage family members in constructive

ways and still encourage students to be informed and have ownership over their own choices.

The advice Kansas State University (2013) gives about choosing a major is good advice - the initial academic major decision should be based on an understanding of self and of all of the options available. Students may find the initial academic major decision a difficult one to make because they lack information about themselves, have unrealistic expectations about certain major choices, or are given college guidance at the expense of guidance on what education is needed in life and work (Doty, 1997). IHEs and middle and high schools should seek to establish or strengthen partnerships in order to connect students to the resources and activities that could inform academic major choice. A parallel task would be to better articulate what students should get out of major exploration experiences (e.g., passion for a field, understanding of required coursework). Instead of just getting students excited about a college, these partnerships should put efforts towards getting students excited about a field of study and how they want to learn.

This study also underscores the importance of further analyzing data to better understand the experiences of different groups of students. Recall that this study seeks to examine what and who may be influencing the initial academic major decision-making process. The additional sub-sample analyses and test for equality of B coefficients reveal that the sources and influence of some factors influences are different between groups. Policy makers and IHEs should pay attention to these differences as they continue efforts to encourage enrollment as a whole in particular

fields of study (e.g., STEM), as well as enrollment by certain groups of students based on sex and race/ethnicity.

This study adds to the broader body of literature on major choice in that undecided is considered as a choice and influences on choice extend beyond demographic or background characteristics. There is, however, room for improvement. One hundred and twenty eight students who specified the undecided track within a specific area of study were put into the declared category of the outcome variable. Recall that 30% percent of the sample of 891 respondents self-reported they matriculated with an undecided major. As such, it is possible that a portion of the 128 students who declared the undecided track in a specific area of study may have very well considered themselves to have experienced the initial academic major decision-making process as undecided in their major. Consequently, the responses of these students may be more like the true undecided students than the declared students with whom they were grouped. Future research warrants a re-analysis of the existing secondary data to reflect the self-perception of these students by categorizing them as starting college with no major at all, or to use a three category dependent variable. Furthermore, additional analyses could be conducted on the existing archival data to examine differences based on specific majors or groups of majors.

Future directions for research include a new administration of an improved survey instrument with additional and larger samples of students. Improvements in the instrument would include a re-conceptualization of one or more measures of intentions, as well as control beliefs. An additional version of the survey instrument

could change the context of the study from a dichotomous outcome of declared or undecided to the choice of a variety of fields of study or even specific majors. Studies conducted within the context of a field of study specific or major specific may reveal, for example, that important referents vary depending on the field or major. For example, students who choose a specialized major may defer to education authority figures over family members since the former may be more knowledgeable about the choice. Expanding participation beyond students who reside on campus could allow for a study that compares the influence of pre-college factors for different groups of students based on residency (i.e., on- or off-campus). Increasing the number of participants so that suggested cases per predictor are met would increase the confidence in the findings, as well as allowing for additional sub-group analyses (e.g., dis-aggregate URM category) and potentially more advanced statistical techniques.

Longitudinal studies on academic major choice, persistence, and graduation are rarely conducted as they are complex and time intensive. Yet a longitudinal design could strengthen this piece of work by collecting survey data when the student submits their college application since the archival dataset used in this study introduces some level of error as a result of the retrospective survey design. Furthermore, by following respondents through graduation or disaffiliation from the institution, additional qualitative and quantitative data can be collected to examine the long term effects of starting declared or undecided. These additional data can also examine the influence of similar TPB constructs on major persistence and/or

satisfaction. For example, does the influence of family continue throughout the course of students' studies?

Conclusion

Most studies of academic major choice examine the choice of a specific major or group of majors, and even fewer consider undecided as a major choice. This exploratory explanatory study sought to examine influences in the initial academic decision-making process in the context of the fundamental decision applicants to college must make – whether to start college with a declared major or none at all. Although the study has some limitations in its design (e.g., cross-sectional, retrospective data), a handful of individual predictors were found to be significant in explaining what induces a student to behave in one way and not the other. This information contributes in small ways to our understanding of a complex human behavior and highlights where interventions can be made to influence the decision-making process. Knowing that decisions are influenced by positive attitudes; affective and evaluative beliefs; important familial referents; and difficulty of the decision allows for both molding the decision in middle and high school and addressing the decision once a student matriculates. The findings also suggest that Azjen's (1991) TPB can be useful in the examination of education-related outcomes, yet further research is warranted.

Appendix

Construct-item Map

Construct	Survey item
Predisposition	*Indicate on the following spectrums your attitude towards starting college with a declared major.* (7-point scale) Useful to Useless Good to Bad Beneficial to Harmful Wise to Foolish Unpleasant to Pleasant Desirable to Undesirable Exciting to Boring Prepared to Ill-prepared Enthusiastic to Apathetic *Indicate your level of agreement with the following statements*. (7-point scale) **Starting college with a declared major would…** Increase my chance of being admitted to college. Symbolize that I was academically prepared for college. Give me a sense of direction while at college. Be a waste of time because I planned to change later. Be something to be proud of. Require me to be in courses for which I was unsure if I was academically prepared. Allow me to graduate on time (e.g., four years or less for a four-year degree program). Limit my opportunities to explore my interests. Allow me to jump right in to the courses that interest me the most. Give me a sense of security knowing what I would be studying.

Deference	*Indicate your level of agreement with the following statements.* (7-point scale) Members of my immediate family (i.e., mother, father, guardian, and/or siblings) thought it was important that I start college with a declared major. Other close relative(s) thought it was important that I start college with a declared major. My high school guidance counselor thought it was important that I start college with a declared major. My high school teacher(s) thought it was important that I start college with a declared major. My classmates thought it was important that I start college with a declared major. My close friends thought it was important that I start college with a declared major. College representatives I met here or at another college/university thought it was important that I start college in a declared major. *Indicate how important the opinion of each of the following people was to you when deciding whether or not to start college with a declared major.* (7-point scale) Immediate family member(s) Other close relative(s) High school guidance counselor High school teacher(s) Classmates Close friends College representative(s)

Volition	*Indicate your level of agreement with the following statement.* (7-point scale) It was mostly up to me whether or not I started college in a declared major. *Indicate your response along the following spectrum.* (7-point scale) For me the decision as to whether or not to start college in a declared major was…(Easy to Difficult) *Indicate how true each of the following was for you.* (7-point scale) **When making the decision whether or not to start college with a declared major…** I only had enough money for four years of college. I was considering too many possible academic majors. I didn't have confidence in myself. I didn't have encouragement or support from family. I didn't have encouragement or support from teachers, staff, or administrators at my high school. I didn't have encouragement or support from friends. I didn't understand the requirements for the majors I was considering. I didn't have the academic skills needed for the majors I was considering. I didn't know what I was good at. I had limited knowledge of a variety of majors. *Indicate if each of the following made the decision whether or not to start college with a declared major more difficult or easier.* (7-point scale) Only having enough money for four years of college made the decision… Having too many possible majors to consider made the decision… Not having confidence in myself made the decision… Not getting encouragement or support from family made the

	decision…
	Not getting encouragement or support from teachers, staff, or administrators at my high school made the decision…
	Not getting encouragement or support from friends made the decision…
	Not understanding the requirements for the majors I was considering made the decision…
	Not having the academic skills needed for the majors I was considering made the decision…
	Not knowing what I was good at made the decision…
	Having limited knowledge of a variety of majors made the decision…
Intentions	*Indicate which resources/activities you utilized before you started college to research possible academic majors.* (Yes, No, Unsure)
	Spoke with someone about majors of interest to me at a college fair
	Spoke with someone about majors of interest to me during a college campus visit
	Spoke with a high school guidance counselor about majors of interest to me
	Surfed college websites
	Participated in a related internship/work experience
	Interviewed someone who graduated in or was currently enrolled in majors of interest to me
	Interviewed someone who taught courses in majors of interest to me
	Took related courses either at my high school, community college, or other college
	Participated in related clubs or other extra-curricular activities while in high school
Behavior	Major as indicated on application for admission.

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